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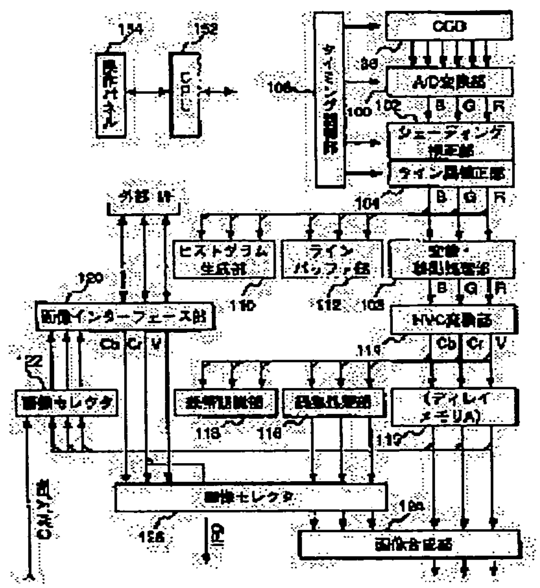
(54) IMAGE PROCESSOR

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a device with which the picture quality of reproduced image can be improved by surely performing area discrimination even when any arbitrary image formation mode is set by providing respective means for designation, gradation variation, judgement, correction and control.

SOLUTION: An A/D converter 100 converts the image data of 100DPI photoelectrically transduced by a CCD sensor 36 to the digital data of 8 bits. In order to eliminate the light quantity nonuniformity of R, G and B data in main scanning direction, a shading correction part 102 stores data reading a white board for correction in an internal shading memory before original reading. After these data are transformed to the reciprocals, they are multiplied with the read data of original information, and the shading is corrected. In order to match the reading position of respective R, G and B sensor chips in the scan direction, an inter-line correction part 104 controls the delay of white data for the unit of line corresponding to scan speed and outputs R, G and B data.



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CLAIMS

[Claim(s)]

[Claim 1] In the image processing system which has an image formation means to be equipped with a means to project manuscript information on a color CCD sensor, and to read an image, and to reproduce a color picture based on the obtained color data The assignment means for specifying the gradation property of color data, and a gradation adjustable means to change a gradation property based on the gradation property specified by the assignment means, A decision means to judge the black alphabetic character field of a manuscript image based on predetermined criteria data from the color data by which adjustable was carried out, The image processing system characterized by having the means which amends to the color data after conversion, and the control means which changes the criteria data in a decision means automatically according to the content of the specified gradation property based on a decision result.

[Claim 2] In order to carry out adjustable [of the scale factor of the image which should be reproduced] in the image processing system which has an image formation means to be equipped with a means to project manuscript information on a color CCD sensor, and to read an image, and to reproduce a color picture based on the obtained color data, The color data by which adjustable was carried out to the means which carries out adjustable [of the reading scale factor of color data] to manuscript image Halftone dot field In order to extract, The number of the isolated points within a certain unit matrix is detected, and it compares with predetermined criteria data. A halftone dot field decision means to judge whether it is a halftone dot field, The image processing system characterized by having the means which amends to the color data after conversion, and the control means which changes automatically the criteria data in a halftone dot field decision means according to the specified scale factor based on the decision result of a halftone dot field decision means.

[Translation done.]

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the image-processing means in a digital color copying machine.
[0002]
[Description of the Prior Art] In the digital color copying machine, the black alphabetic character section in a manuscript was distinguished, the halftone dot field in the technique which the repeatability of the black alphabetic character section raises, or a manuscript was distinguished, and the technique out of which it is made for a moire phenomenon not to come has become common.
[0003] These field distinction approaches are the edge component from color data and saturation component after manuscript reading. Or the halftone dot number per unit dot matrix was extracted, and it has distinguished by comparing the extract result with a certain criteria data.
[0004] For example, an edge component detects the minimum color data MIN (R, G, B) as a lightness component from R, G, and B data, and is called for from the result on which spatial filters, such as its primary differential and secondary differential, were made to act. A saturation component is called for according to the difference (MAX(R, G, B)-MIN (R, G, B)) of the maximum color-minimum color. Moreover, halftone dot distinction judges in how many dots of the isolated-point dot exist in a unit dot matrix from the aforementioned lightness component by detecting the dot isolated from gradation distribution.
[0005] On the other hand, in the copying machine, a copy scale factor and copy concentration were automatically specified by the manual from the control panel, and the function which copies has become common. In this case, with the copying machine of a digital method, if it is scale-factor actuation about R and G which were read by the color CCD sensor etc., and B data and is copy concentration about resolution, control of a scale factor and concentration is performed by carrying out adjustable [of the gradation property] according to assignment.
[0006]
[Problem(s) to be Solved by the Invention] However, when it was hard coming to judge an alphabetic character edge thin when concentration is set up so that a substrate may be removed since saturation level and edge level are changed with a gradation property and a halftone dot period is changed by scale-factor control and a scale factor was reduced, the alphabetic character with many halftone dot stroke counts was incorrect-judged to be a halftone dot, and had caused lowering of an image rendering. that is, if a manuscript white criteria reflection factor is made into 83.2% and the data of a comparatively thin alphabetic character (0.4/40% of ID) like pencil writing are made into the example of an alphabetic character edge in adjustment of concentration level, the amount of edges of said false lightness signal V37-30 carried out, and primary and a secondary differential filter should be read as follows by the case where concentration level is made into 256 steps — it comes out.
[0007]
V37-30 255 255 255 255 255 123 123 123 255 255 255 255 255floor line 27-20 0 0 0 66 66 66 132 66 66 66 0 0 0floor line 17-10 0 0 0 33 66 66 0 66 66 33 0 0 If the phase of 0, however

concentration level is set as 192, it will change as follows.
[0008]
V37-30' 255 255 255 255 255 164 164 164 255 255 255 255 255floor line 27-20 0 0 0 46 46 46 109 46 46 46 0 0 0floor line 17-10 0 0 — substrate level adjustment value set up in the concentration processing section as mentioned above 0 (AE level —) 0 23 46 46 0 46 46 23 0 0 With a manual adjustment value, it will change to the amount of alphabetic character edges. Now, if it carries out adjustable [of the substrate level], a field distinction result will be influenced, and a copy will do change besides substrate level.
[0009] In this case, if it sets up in the direction which flies substrate level, it will be hard coming to judge it as an alphabetic character, and edge enhancement will not start it as the thin alphabetic character section, but the becoming phenomenon which is hard to see will arise.
[0010] Moreover, in halftone dot distinction processing, it is eventually judged by the size of the number of the isolated points within a 41x9-pixel matrix. It will read, if a copy scale factor is set up, and resolution is proportional to a scale factor. That is, the number of the isolated points within the 41x9-pixel matrix used as criteria will be dependent on a scale factor.
[0011] For example, the 45-degree halftone dot of screen 100L is by actual size 400dpi reading. (41*9*100^2) /(2*400^2) =11.5 The halftone dot of an individual is detectable. However, a scale factor is at *0.5. 11.5/(0.5^2) =46 The halftone dot of an individual will be detected. That is, it is in inverse proportion to the surface ratio of a scale factor.
[0012] For this reason, for a cutback scale factor, it becomes easy to carry out a halftone dot field judging to carrying out the same judgment as actual size. Especially, an alphabetic character with many stroke counts will be judged to be a halftone dot, and will become the fragmentary rendering in which the color bled by the change of the cancellation and the gradation rendering approach of the smoothing processing mentioned later, or edge enhancement and color blot amendment.
[0013] The object of this invention is to offer the image processing system which can carry out field distinction certainly and can raise the image quality of a rendering image, even if a user sets up the image formation mode of arbitration.
[0014]
[Means for Solving the Problem] In the image processing system which the 1st invention is equipped with a means to project manuscript information on a color CCD sensor, and to read an image, and has an image formation means to reproduce a color picture, based on the obtained color data in order to solve the above-mentioned technical problem The assignment means for specifying the gradation property of color data, and a gradation adjustable means to change a gradation property based on the gradation property specified by the assignment means, A decision means to judge the black alphabetic character field of a manuscript image based on predetermined criteria data from the color data by which adjustable was carried out, It is characterized by having the means which amends to the color data after conversion, and the control means which changes the criteria data in a decision means automatically according to the content of the specified gradation property based on a decision result.
[0015] Moreover, it sets to the image processing system which has an image formation means to be equipped with a means to project manuscript information on a color CCD sensor, and to read an image in the 2nd invention, and to reproduce a color picture based on the obtained color data. The color data by which adjustable was carried out to the means which carries out adjustable [of the reading scale factor of color data] in order to carry out adjustable [of the scale factor of the image which should be reproduced] to manuscript image Halftone dot field In order to extract, The number of the isolated points within a certain unit matrix is detected, and it compares with predetermined criteria data. A halftone dot field decision means to judge whether it is a halftone dot field, It is characterized by having the means which amends to the color data after conversion, and the control means which changes automatically the criteria data in a halftone dot field decision means according to the specified scale factor based on the decision result of a halftone dot field decision means.
[0016]
[Embodiment of the Invention] In the image processing system which has an image formation means to be equipped with a means according to the 1st invention to project manuscript

information on a color CCD sensor, and to read an image, and to reproduce a color picture based on the obtained color data When the gradation property of color data is specified by the assignment means, by a control means changing criteria data automatically according to the content of the specified gradation property, based on this, a decision means judges the black alphabetic character field of a manuscript image, and it is based on a decision result, and is **** about amendment to the color data after conversion. Moreover, it sets to the image processing system which has an image formation means to be equipped with a means to project manuscript information on a color CCD sensor, and to read an image in the 2nd invention, and to reproduce a color picture based on the obtained color data. If it carries out adjustable [of the scale factor of the image which a scale-factor adjustable means should reproduce], a control means will change automatically the criteria data in a halftone dot field decision means according to the specified scale factor, and a halftone dot field decision means will extract the halftone dot field of a manuscript image from color data based on this changed criteria data.
[0017]
[Example] Hereafter, the example of this invention is explained with reference to an attached drawing.
[0018] (1) The whole digital color copying machine block diagram 1 shows the whole digital full colour copying machine configuration. A manuscript is read in the image scanner section 30, and the digital-signal-processing unit 10 performs signal processing. The printer section 20 is full color in a form, and carries out the printed output of the image corresponding to the manuscript image read in the image scanner section 30 to it.
[0019] In the image scanner section 30, although pressed down by the prevention pressure plate 39, when equipping with an automatic manuscript feed gear (not shown), this replaces the manuscript placed on manuscript base glass 31. The manuscript on manuscript base glass 31 is irradiated with a lamp 32, and is led to Mirrors 33a, 33b, and 33c, and an image is changed into it by an epilogue, full color information red (R), and the Green (G) and blue (B) component on the linear full color sensor (CCD) 36 with a lens 34, and it is sent to the signal-processing section 10. In addition, by driving the scanner-motor 37, the 1st slider 35 is a rate V, and the 2nd slider 40 runs by V/2 perpendicularly mechanically to the electric scanning direction of a color sensor, and it scans the whole manuscript surface. Moreover, the white plate 38 for shading compensations is formed in the edge of manuscript base glass 31.
[0020] The read signal is processed electrically, it decomposes into each component of a Magenta (M), cyanogen (C), yellow (Y), and black (Bk), and the signal-processing section 10 is sent to the printer section 20. About one manuscript scan in the image scanner section 30, one component is sent to the printer section 20 one by one among C, M, Y, and Bk, and one print-out is completed by total of four manuscript scans (field sequential transmittal mode).
[0021] The picture signal of C, M, Y, and Bk which are sent from the signal-processing section 10 carries out the actuation modulation of the semiconductor laser 214 according to picture signal level by laser diode drive (PHC section). A laser beam scans a photoconductor drum 206 top through the polygon mirror 215, the f-theta lens 216, and the clinch mirrors 217a and 217b.
[0022] The development unit is constituted by each development sections 208a, 208b, 208c, and 208d of C, M, Y, and Bk, and development counters 208a, 208b, 208c, and 208d touch a photoconductor drum 206, and it develops with a toner the electrostatic latent image formed on the photoconductor drum 206 charged with the electrification charger 207. On the other hand, the form to which paper has been fed from the feed units 201a, 201b, and 201c is twisted around the imprint drum 202 with the adsorption charger 204, it conveys to an imprint location with the timing roller 203, and the image developed on the photoconductor drum 206 by the imprint charger 205 is imprinted in a form. Thus, after the sequential imprint of the four colors of C, M, Y, and Bk is carried out, a form is separated by the separation chargers 209a and 209b, it is conveyed, fixing rollers 210a and 210b are passed, and it is discharged by the paper output tray 211. In addition, it is the separation pawl with which 218,219 separates the criteria location sensor of an imprint drum, and 220 separates a form from an imprint drum.
[0023] (2) Processing drawing 2 and drawing 3 of a picture signal in the signal-processing section show the configuration of the whole image processing of the signal-processing section 10. The image scanner section 30 acquires the analog signal in which was made to carry out image

formation of the reflected light from a manuscript side on the linear CCD sensor 36, and photo electric translation was carried out to each color-separation information on R, G, and B by the microoptics system. These signals are sent to the signal-processing section 10.
[0024] The A/D-conversion section 100 changes into 8 bits (256 gradation) digital data the image data of 400DPI by which photo electric translation was carried out by the CCD sensor 36 for every color information on R, G, and B with an A/D converter. In order that the shading compensation section 102 may lose the quantity of light nonuniformity of the main scanning direction of R, G, and B data, after storing in internal shading memory (not shown) the data which read the white plate 38 for shading compensations in advance of manuscript reading independently as criteria data and changing into each R, G, and every B at the inverse number, it carries out multiplication to the reading data of manuscript information, and amends shading. In order to double the reading location of the scanning direction of each sensor chip of R, G, and B, according to scan speed (rate of variable power by the side of vertical scanning), using an internal field memory (not shown), the line amendment section 104 carries out delay control of the white data per line, and outputs the data of R, G, and B. The timing-control section 106 controls the timing of the CCD sensor 36, the A/D-conversion section 100, the shading compensation section 102, and the line amendment section 104. Variable power and migration control of a main scanning direction are performed by outputting [variable power and the migration control section 108] for every R, G, and B data and inputting two pieces by turns to one line using the line memory for variable power, it reading with the write-in timing, and controlling timing independently about R and G which were outputted from the line amendment section 104, and B data. In this control, after writing in in the cutback side and reading by the amplification side before according to the rate of variable power, interpolation processing was performed, and a deficit and shakiness of an image are prevented. Moreover, this control performs image repeat processing, amplification continuous-shooting processing, and mirror processing.
[0025] From R after the amendment between lines obtained by carrying out the preliminary scan of the manuscript information, G, and B data, the histogram generation section 110 generates a lightness signal, and creates the histogram of a manuscript. In order that a manuscript may fly automatically the substrate level of the automatic color selection distinction which judges a color/black and white, or a manuscript from the acquired histogram information, decision of manuscript substrate level and manuscript mode (a criterion / photograph mode) of copy actuation are set up automatically.
[0026] The HVC converter 114 once changes R from variable power and the migration control section 108, G, and B data into a lightness signal (V data) and a color-difference signal (Cr, Cb data). The edit processing section 116 performs editing tasks, such as a color change and coloring by closed-loop field detection, in response to V, Cr, and Cb data based on assignment of the editor which is an option.
[0027] The bill recognition section 118 judges whether the manuscripts loaded on manuscript glass 31 are a bill, negotiable securities, etc., and orders the prohibition on a copy based on the result.
[0028] The image interface section 120 transmits an image data to an external device in response to V and Cr which are sent through the 1st image selector 122, and Cb data. Since it corresponds to the chrominance-signal interface of various image datas, in this block, it changes into X, Y, Z signal and L* that are R, G, B signal, and a general-purpose color space, a*, b* signal, etc. from V, Cr, and Cb signal, and it outputs to an external device or has the function to change into V, Cr, and Cb signal the image data transmitted to reverse from the outside. C, M, Y, and Bk data which are furthermore transmitted to the printer section 20 are transmitted to an external device, or there is also a function to transmit to the printer section 20 side, in response to C, M and Y from an external device, and Bk signal.
[0029] The image composition section 124 performs image composition (fitting and character composition) with the manuscript data from the HVC converter 114, after choosing V and Cr which were outputted from the image interface section 120 or the edit processing section 116 through the 2nd image selector 126, or Cb data.
[0030] The HVC controller 128 is the object which performs image adjustment corresponding to

three sensation of human being called lightness (V: brightness), a hue (H: hue), and saturation (C: vividness) about V from the image composition section 124, Cr, and Cb data, and adjusts independently for every H, V, and C based on assignment of a control panel.

[0031] The air entrainment section 130 controls the substrate level of a manuscript to a lightness component based on the information acquired in the histogram generation section.

[0032] The reverse HVC converter 132 carries out data conversion to R, G, and B data from V, Cr, and Cb data again.

[0033] In the color correction section 134, while the LOG amendment section 136 changes into concentration data (DR, DG, DB) first R and G which it reconverted, and B data, the monochrome data generation section 138 generates the gradation data for a monochrome rendering (DV) after creating lightness data from R, G, and B data. The UCR-BP processing section 140 makes the difference (MAX(R, G, B)-MIN (R, G, B)) of the maximum of R, G, and B data, and the minimum value manuscript saturation information. Lower color clearance and ****** processing according to those values are performed by using the minimum value (MIN (DR, DG, DB)) of DR, DG, and DB as the bottom color component of a manuscript, and CO, MO, YO, and Bk data are created from DR, DG, and DB data. The masking operation part 142 performs masking data processing for color correction, and changes C after UCR processing, M, and Y data (CO, MO, YO) into the CMY data for color reproduction according to the color toner of the printer section 20. When judged as black and white by assignment or ACS distinction of a control panel, as monochrome copy mode, the color data selection section 144 outputs DV data for monochrome, according to a rendering process signal (CODE), at the time of C, M, and Y rendering process, masking data-processing data (C, M, Y data) are chosen, and chooses BP processed data (Bk data) at the time of Bk rendering process, and outputs in the full color mode.

[0034] On the other hand, from R, G, and B data, the field distinction section 146 distinguishes black alphabetic character distinction, halftone dot distinction, etc. from the difference (MAX(R, G, B)-MIN (R, G, B)) of the minimum value (MIN (R, G, B)), maximum, and the minimum value, and outputs the result (JD signal) and amendment data (USM signal). Moreover, since it is compatible in the repeatability of an image alphabetic character field, and the graininess of an image, the LIMOS signal for carrying out adjustable [of the image rendering period] to a printer side is outputted.

[0035] To C, M, Y, and Bk data which are inputted, the MTF amendment section / sharpness controller 148 is controlling [processing / edge enhancement, color blot amendment / smoothing] from a field distinction result, and performs optimal amendment of a copy image.

[0036] Furthermore, gamma amendment / color-balance controller 150 adjusts gamma curve and the color-balance of C, M, Y, and Bk according to the concentration level information that it was inputted from the control panel. In this way, C, M and Y which performed various amendments, and Bk data are transmitted with the LIMOS signal which changes the gradation rendering approach to a printer side, and the full color copy image of 400DPI and 256 gradation is obtained.

[0037] Here, CPU152 controls the signal-processing section 10, and a control panel 154 performs I/O and display of data.

[0038] (3) Explain copy mode, next the copy mode of operation of this full colour copying machine. Drawing 4 is a basic screen in a control panel 154, and a user can set up various modes.

[0039] (a) surface treatment (air entrainment and manual setting out) — it can choose whether to choose one level of eight steps of manual assignment of whether to perform automatic exposure (AE) processing about surface treatment first. lightness gradation assistant nature if it is color criterion (substrate white) or monochrome standard manuscript, as performed five sorts of manuscript classification from manuscript histogram information by preliminary scan actuation (a color criterion (substrate white, substrate coloring) / photograph manuscript, and monochrome criterion / photograph manuscript), and shown in drawing 12 and drawing 13 by air entrainment — carrying out — other classification (photograph) — if it becomes, automatic selection of the manual central level will be made. It is a content as shown in a table 2 at the time of manual assignment.

[0040] (b) Manuscript mode ACS (automatic color mode selection) mode or four sorts of manuscript modes can be chosen. Selection of ACS mode chooses either of four manuscript modes automatically by the judgment of the manuscript classification by preliminary scan actuation. When it is judged as monochrome manuscript, automatic selection of either a monochrome criterion / photograph mode is made, and monochrome mode copy actuation by the black 1 color-reproduction process is performed. If it is a color copy, automatic selection of either a color standard manuscript / photograph mode will be made, and copy actuation by the full color rendering process by four colors of C, M, Y, and Bk will be performed. Although it is the same also at the time of a manual, when a monochrome criterion / photograph mode is chosen, an actuation screen changes to a monochrome mode actuation screen (not shown), and the mixing ratio of R and G which determine the gradation data for monochrome as a manuscript parameter, and B data is chosen. (At the time of ACS mode, relative-luminous-efficiency distribution is set up for R, G, and B average sensitivity profile as a default at the time of a manual.) A rendering color can be chosen from 16 colors containing black again.
[0041] In addition, there are a creation function perform image creation and image adjustment of the color-separation mode which reproduces C, M and Y for the 1st page of every manuscript side, and Bk data in the paper, NEGAPOJI reversal and a base color, and image IRESU, and an image-quality adjustment function change simultaneous [five kinds of a hue (hue) / saturation (vividness) / sharpness / gamma amendment (contrast light and darkness) / color-balances (R-C/G-M/B-Y / copy concentration)], and express two or more monitor images simultaneously. The explanation with detailed all is omitted.
[0042] (4) In the copying machine of preliminary scan actuation this example, perform preliminary scan actuation, analyze the result, distinguish manuscript classification or perform automatic exposure (AE) processing and automatic color selection (ACS) processing. The manuscript scan unit has stopped to the shading compensation plate 38 side of reverse with the manuscript criteria location at the time of this scan before a copy. If a copy carbon button is pushed with a control panel 154, it will return to a manuscript criteria location, moving in order to read amendment data, scanning the shading compensation plate 38, and creating the histogram data of a manuscript after lamp burning. Automatic exposure processing and automatic color selection processing are decided from the created histogram data, and this scanning actuation is started. This is shortening first copy time amount.
[0043] (5) Explain histogram generation, next the histogram generation in preliminary scan actuation. Drawing 5 is the block diagram of the histogram detecting element 110, and the histogram detecting element 110 asks for the histogram of R in manuscript area, G, and B data at the time of preliminary scan actuation. Since the inside of a histogram memory 202 and 204 is beforehand initialized before preliminary scan initiation, CPU152 writes "0" in the address of all gradation level (0-255) to histogram memories 202 and 204. From R and G which were inputted from the line amendment section 104, and B data (8 bits), the lightness creation section 200 computes a lightness signal (VH) based on a degree type, and this is inputted into the 1st histogram memory 202 and the 2nd histogram memory 204 as the address.
[0044]
[Equation 1]
VH=0.31640625*R+0.65625*G+0.02734375*B (1) The lightness signal searched for by this formula is approximated to human being's relative luminous efficiency (brightness). It is automatic exposure processing that the object of histogram creation here is R, G, and not B data but the lightness data VH, and it is for amending to the data divided into lightness and a color-difference signal, and is explained to a detail later.
[0045] Based on the sampling period set point from CPU152, the sampling period decision circuit 206 determines spacing (rate of infanticide) incorporated to histogram memories 202 and 204. if this creates the histogram of all the dots of the maximum manuscript size (A3) — a maximum of 32 — it is because M-bit memory space is needed, and a sampling period is thinned out moderately (main scanning direction: 1/8, direction:of vertical scanning 1/4), and it is made 1M bit. Drawing 6 is drawing showing one example of the situation of the sampling in histogram generation. When the manuscript (hatching part) placed on manuscript base glass 31 is read, the data of the location of O mark are sampled.

[0046] Furthermore, manuscript size is detected before the preliminary scan and various signals are inputted into the sampling period decision circuit 210 from the timing-control section 106. Here, the /HD signal (main scanning direction) and /VD signal (the direction of vertical scanning) which show manuscript size area are inputted into the sampling period decision circuit 210, and generation of a histogram is permitted only in the effective manuscript area. In addition, /TG is a horizontal-scanning synchronizing signal and has a period in every line. (On these descriptions, the signal which gave "/" to the head means a negative logic signal.) VCLK is the synchronous clock of image data again.
[0047] If Address ADR is inputted into histogram memories 202 and 204, the histogram data of the address will be read, +1 will be added to the data with adders 208 and 210, and it will write in the again same address. That is, as actuation of a histogram, it becomes the lead modification light cycle which makes 8 dots one period, the address of histogram memories 202 and 204 shows gradation level (lightness), and data express the frequency (number) of each gradation level. When a preliminary scan is completed, CPU152 reads the frequency data of each gradation from histogram memories 202 and 204. The contents, such as automatic exposure actuation and automatic color selection actuation, are determined from the histogram data obtained in preliminary scan actuation so that it may explain later.
[0048] Two sorts of histogram memories 202 and 204 are prepared because [of automatic color selection processing]. The 1st histogram memory 202 is asking for the lightness histogram of a manuscript simply, and the 2nd histogram memory 204 is asking for the histogram of the achromatic color dot in a manuscript. For this reason, the minimum value circuit 212 and the maximum circuit 214 detect the MAX value and MIN value of R and G which were inputted, and B data, and search for both difference by the subtraction circuit 216. And when a comparator 218 judges that it is smaller than level (SREF) predetermined in the difference, the writing to the 2nd histogram memory 204 of lightness VH data is permitted. As for the (MAX value-MIN value) of R, G, and B data saying [being small], manuscript data show that it is achromatic color data. Therefore, the 2nd histogram memory 204 means that a histogram is calculated only at the time of chromatic color data. In addition, /WE is always "L" level and can write in the 1st histogram memory 202 about all pixels.
[0049] (6) Automatic color selection processing (ACS) automatic color selection mode is the mode in which the manuscript loaded on manuscript base glass 31 identifies monochrome manuscript or a color copy, and determines copy mode automatically. Thereby, in order for what is necessary to be just to carry out an image rendering at the rendering process of only Bk, a copy speed goes up monochrome manuscript. When using an automatic manuscript transport device especially, even if monochrome manuscript and the color copy are loaded together, a suitable copy will be obtained without an operator being conscious.
[0050] Decision of automatic color selection is explained below. h1 (n) expresses the frequency data in the level n of the lightness of the 1st histogram created by the 1st histogram memory 202, and h2 (n) expresses the frequency data in the level n of the lightness of the 2nd histogram created by the 2nd histogram memory 204. CPU152 subtracts each frequency (h2 (n)) of the 2nd histogram 204 from each frequency (h1 (n)) of the 1st histogram 202, and creates the 3rd histogram (h3(n) =h1(n)-h2(n)). This expresses the histogram of the chromatic color part of a manuscript. As shown in drawing 7 R> 7, the following amounts can be analyzed, for example from two histograms created to two sorts of histogram memories 202 and 204. the 1st histogram memory 202 — the number of dots of the substrate (white) field in W= manuscript (n=mu 1-255), the number of dots of the halftone (gray) field (n=mu 2-mu1) of M= black and white, the number of dots of B= black field (n=0-mu2), and the total number of pixels in the total frequency sum = manuscript size of the S= 1st histogram. Furthermore, the number of dots of the 2nd histogram memory 204 to C= color field (n=sigma 1-sigma2). Namely, [0051]
[Equation 2]

$$W = \sum_{n=\mu 1}^{255} h1(n)$$

$$M = \sum_{n=\mu 2}^{\mu 1} h1(n)$$

$$B = \sum_{n=0}^{\mu 2} h1(n)$$

$$S = \sum_{n=0}^{255} h1(n)$$

$$C = \sum_{n=\sigma 2}^{\sigma 1} h3(n)$$

[0052] In automatic color selection, manuscript classification is distinguished from the ratio of an achromatic color and a chromatic color based on lightness data. Using S and C which were obtained from the histogram, it asks for the ratio of the chromatic color dot in a manuscript, and, specifically, judges whether a color copy is carried out or monochrome copy is carried out. As explained previously, C is the number of dots of a color field (n=sigma 1-sigma2), and Sn is the total number of pixels in manuscript size. Therefore, C/S corresponds to the ratio of a chromatic color and a (chromatic color + achromatic color). That is, since there are few chromatic colors with [a decision type (C/S)] a reference value [below], monochrome copy mode is set up, and if larger than a reference value, since there are many chromatic colors, full color copy mode will be set up. Decision of automatic color selection, especially the effect of manuscript size can be disregarded by using S here at a denominator.

[0053] Drawing 8 shows the flow of automatic color mode selection of CPU152. First, the histogram of lightness is created to the 1st and the 2nd histogram memory 202 and 204 by the histogram creation section 110 (step S100). next, C and S of the above [histogram] -- asking (step S102) -- a ratio -- C/S is calculated (step S104). And if C/S is larger than a predetermined threshold (it is YES at step S106), it will judge with it being a color copy (step S108), otherwise, (it is NO at step S110) will judge with it being monochrome manuscript (step S112).

[0054] (7) To a manuscript classification distinction pan, CPU152 judges five sorts of following manuscripts (table 1 reference) as the first phase of automatic exposure (AE) processing first from the information on histogram memories 202 and 204, and the result (refer to drawing 8) of automatic color selection (ACS).

[0055] (a) Black-and-white picture manuscripts (a black-and-white picture, monochrome highly minute halftone dot printing, etc.)

(b) Monochrome standard manuscript (with monochrome alphabetic character, a line drawing, etc., it is the comparatively white manuscript of a substrate)

(c) Full color photograph manuscripts (a color film photo, color highly minute halftone dot printing, etc.)

(d) Color standard manuscript (substrate white) (comparatively white manuscript containing a color alphabetic character, color line drawing, etc. of a substrate)

(e) Color standard manuscript (substrate coloring) (manuscript with which the color sticks to the substrate)

It is obtained from a histogram, and automatic color selection also analyzes a histogram and manuscript classification is performing it (refer to drawing 9). The view of manuscript classification decision is as follows. A color copy and monochrome manuscript ask for the number of pixels more nearly colorless than a histogram, and the number of the pixels which are chromatic colors, as automatic color selection was explained previously, if larger than a reference value with the ratio of the number of pixels and the number of pixels of the whole achromatic color which are a chromatic color, it will judge that it is a color copy, otherwise, it is judged that it is monochrome manuscript. Moreover, a photograph manuscript and a standard manuscript can be judged from distribution of a histogram. A standard manuscript is a manuscript which mainly consists of an alphabetic character, and a histogram shows binary distribution as shown in drawing 12 or drawing 13 . Here, also when a substrate is not white, it takes into consideration. When binary distribution is shown, it judges that it is a standard manuscript, and when that is not right, it is judged that it is a photograph manuscript. From a histogram, specifically, it is judged that it is a standard manuscript noting that it is binary distribution as compared with the number of pixels of a density range (black side), and the number of pixels near white, when there is little former. In the case of a color standard manuscript, thereby, the case where a substrate is white can judge. In the case of a color copy, since distinction with the standard manuscript and color photography manuscript to which the substrate color is attached is the need, a thing wide range [the distribution in a histogram] and average is judged to be a color photography manuscript, and when that is not right, it is judged that it is a substrate coloring color standard manuscript. Specifically, it has judged with the difference of the maximum and the minimum value in a histogram.
[0056] Drawing 9 shows the flow of the manuscript classification distinction by CPU152. From the data h1 of the 1st and the 2nd histogram memory 202 and 204 (n) and h2 (n) [first,] Next, the various frequency sums G25, G24, G23, G22, G21, G20, G35, G34, G33, G32, G31, and G30 to define are calculated. Furthermore It asks for the substrate level a (gradation level which shows the 0.4 or less output-data ID [in the 2nd histogram memory 204] maximum frequency), and the alphabetic character level b (gradation level which shows the maximum frequency by 0.6 or more output-data ID in the 2nd histogram memory 204) (step S200).
[0057]
[Equation 3]

$$G_{25} = \sum_{n=200}^{255} h2(n)$$

$$G_{24} = \sum_{n=128}^{199} h2(n)$$

$$G_{23} = \sum_{n=80}^{127} h2(n)$$

$$G_{22} = \sum_{n=48}^{79} h2(n)$$

$$G_{21} = \sum_{n=24}^{47} h2(n)$$

$$G_{20} = \sum_{n=0}^{23} h2(n)$$

$$G_{35} = \sum_{n=200}^{255} h3(n)$$

$$G_{34} = \sum_{n=128}^{199} h3(n)$$

$$G_{33} = \sum_{n=80}^{127} h3(n)$$

$$G_{32} = \sum_{n=48}^{79} h3(n)$$

$$G_{31} = \sum_{n=24}^{47} h3(n)$$

$$G_{30} = \sum_{n=0}^{23} h3(n)$$

[0058] Although the level 0-255 of Lightness VH corresponds to the left-hand side of drawing 10 with output-data ID so that it may be shown These values are set in the six range of output data (0.2 or less, 0.2 to 0.4, 0.4 to 0.6, 0.6 to 0.8, 0.8-1.1, and 1.1 or more). It is the value which totaled h2 (n) or h3 (n), and (=h1(n)-h2(n)) corresponding to whether lightness data are larger than threshold SREF or to be small. In addition, in drawing 10 , the range shown by C, M, Y, R, G, and B shows the VH's existence range in a corresponding color.
[0059] Next, in order to distinguish a (Photograph a) - (c) and standard manuscript (b) - (d) and substrate coloring standard manuscript (e), the judgment of a photograph manuscript and a substrate coloring manuscript is performed. First, distinction with monochrome manuscript (a) - (b) and color copy (c) -(d) - (e) can be performed from the processing result of the above-mentioned automatic color selection (ACS) (step S202). If the distinction result of automatic color selection is a color (it is YES at step S202), it will progress to step S204 and the classification of a color copy will be distinguished (alpha 2 expresses a threshold here). case [first,] the rate that the frequency sum (it is equivalent to parts other than the massecuite ground) of the achromatic color beyond output-data (ID) 0.4 and the chromatic color beyond output-data (ID) 0.2 occupies to the manuscript total frequency (Sn) is small — (— at step S204, since there are many YES) and white parts, it is judged as a color standard manuscript (substrate white) (b) (step S206). And about an image processing, the preparation of surfaces sets up automatic exposure (AE) processing, sets up black alphabetic character distinction processing, sets up gradation rendering change-over processing, and makes manuscript mode a color canonical mode (step S208). case the rate that the frequency sum of the achromatic color

beyond output-data (ID) 0.4 and the chromatic color beyond output-data (ID) 0.2 occupies to the manuscript total frequency (S) is large — (— it judges whether NO) and the ratio which the frequency sum in the frequency block which has a chromatic color further occupies are dramatically high at step S204 (alpha 3 expresses a threshold to step S210 and here). It specifically asks for the ratio of the difference of the maximum frequency sum in the frequency blocks G30-G34 with a chromatic color, and the minimum frequency sum, and the manuscript total frequency, and when this ratio is not very high, since NO) and image data are not average over all lightness gradation, it is judged as that (a) by which the substrate of a color standard manuscript is stained at the (step S210 (step S212). And about an image processing, the preparation of surfaces is made into the center of standard manual setting out, it sets up black alphabetic character distinction processing, sets up gradation rendering change-over processing, and makes manuscript mode a color canonical mode (step S214). Otherwise, (it is YES at step S210) since image data is average over all lightness gradation, it judges that it is a color photography manuscript (c) (step S216), and about an image processing, the preparation of surfaces is made into the center of photograph manual setting out, black alphabetic character distinction processing is not set up, and gradation rendering change-over processing is not set up, either, but let manuscript mode be color photography mode (step S218).

[0060] On the other hand, if the distinction result of automatic color selection (ACS) is not a color (it is NO at step S202), it will progress to step S220 (alpha 1 expresses a threshold here). case the rate that the frequency sum of the achromatic color beyond output-data (ID) 0.4 occupies to the manuscript total frequency (S) is small — (— judging it as YES) and a black-and-white picture (e) at step S220, (step S222) about an image processing, the preparation of surfaces sets up the center of a photograph manual, does not set up black alphabetic character distinction processing, and does not set up gradation rendering change-over processing, either, but makes manuscript mode a monochrome canonical mode (step S224). Otherwise, (it is NO at step S220) since there are many white parts, it judges that it is monochrome standard manuscript (d) (step S226), and about an image processing, the preparation of surfaces sets up automatic exposure (AE) processing, and does not set up black alphabetic character distinction processing, but sets up gradation rendering change-over processing, and makes manuscript mode a monochrome canonical mode (step S228).

[0061] Finally, each manuscript classification judging result is displayed on the basic operation screen (drawing 4) of a control panel 154 (step S230). If this display does not exist, since the judgment result of manuscript classification is not known, a user has a possibility of becoming anxiety. Then, the user enabled it to understand a judgment result immediately by displaying manuscript classification on a control panel 154.

[0062] Judgment of manuscript classification (a) - (e) and image-processing setting out corresponding to it were completed by the above processing. A table 1 shows the content in the automatic color selection (ACS) and image-processing mode to each manuscript classification, and manuscript mode. Moreover, a table 2 shows setting out of the surface treatment in various modes.

[0063]

[A table 1]

原稿種別と画像処理

原稿種別	ACS判断	下地調整	黒文字判別処理	階調再現切換	原稿モード
カラー標準原稿（下地色付き）	カラー	標準マニュアル中央	有	有	カラー標準
カラー標準原稿（下地白）	カラー	AE	有	有	カラー標準
カラー写真原稿	カラー	写真マニュアル中央	なし	なし	カラー写真
白黒標準原稿	モノクロ	AE	なし	有	モノクロ標準
白黒写真原稿	モノクロ	写真マニュアル中央	なし	なし	モノクロ写真

[0064]
[A table 2]

下地処理

AE処理		モノクロ原稿：Vout=256*(Vin-8-b)/{(a-8)-b} カラー原稿：Vout=256*(Vin-8)/(a-8)
マニュアル調整	+2	カラー標準モード：Vout=256*(Vin-8)/(256-8) モノクロ標準モード：Vout=256*(Vin-16)/(256-16) 写真モード：Vout=256*(Vin-8)/(256-8)
	+1	カラー標準モード：Vout=256*(Vin-8)/(240-8) モノクロ標準モード：Vout=256*(Vin-16)/(240-16) 写真モード：Vout=256*(Vin-8)/(244-8)
	±0	カラー標準モード：Vout=256*(Vin-8)/(224-8) モノクロ標準モード：Vout=256*(Vin-16)/(224-16) 写真モード：Vout=256*(Vin-8)/(232-8)
	−1	カラー標準モード：Vout=256*(Vin-8)/(208-8) モノクロ標準モード：Vout=256*(Vin-16)/(208-16) 写真モード：Vout=256*(Vin-8)/(220-8)
	−2	カラー標準モード：Vout=256*(Vin-8)/(192-8) モノクロ標準モード：Vout=256*(Vin-16)/(192-16) 写真モード：Vout=256*(Vin-8)/(208-8)
	−3	カラー標準モード：Vout=256*(Vin-8)/(176-8) モノクロ標準モード：Vout=256*(Vin-16)/(176-16) 写真モード：Vout=256*(Vin-8)/(196-8)
	−4	カラー標準モード：Vout=256*(Vin-8)/(160-8) モノクロ標準モード：Vout=256*(Vin-16)/(160-16) 写真モード：Vout=256*(Vin-8)/(184-8)
	−5	カラー標準モード：Vout=256*(Vin-8)/(144-8) モノクロ標準モード：Vout=256*(Vin-16)/(144-16) 写真モード：Vout=256*(Vin-8)/(176-8)

[0065] (8) The copying machine of HVC conversion and HVC adjustment this example changes processing of image data into HVC data, and performs it. The HVC converter 114 is equipped

with the matrix computing element which changes R, G, and B data into the signal of the color space which consists of a lightness signal (V) and two sorts of color-difference signals (Cr, Cb).
[0066]
[Equation 4]

$$\begin{vmatrix} V \\ Cr \\ Cb \end{vmatrix} = \begin{vmatrix} 0.31640625 & 0.65625 & 0.02734375 \\ 1 & -0.9609375 & -0.0390625 \\ -0.32421875 & -0.67578125 & 1 \end{vmatrix} * \begin{vmatrix} R \\ G \\ B \end{vmatrix} \quad (4)$$

[0067] The three attributes of color of the color which consists of a hue, lightness, and saturation are searched for as follows using V, Cr, and Cb signal.
[0068]
[Equation 5]
Lightness (Value) = V saturation (Chroma) = (Cr2+Cb2) 1/2 (5)
hue (Hue) = arctan (Cb/Cr) -- the reason changed into such signals V, Cr, and Cb is because the processing (image composition, automatic exposure processing, and HVC adjustment) performed in the latter part becomes easy while realizing high definition-ization by performing processing similar to human being's sensation.
[0069] The output of the HVC converter 114 is transmitted to the processing section after the image composition section 124, and also it performs image edit of a color change etc. in the edit processing section 116. On the other hand, it judges whether manuscripts are a bill, negotiable securities, etc. in the bill recognition section 118, and prohibition of copy actuation is ordered. And in the image composition section 124, V and Cr which were outputted from the HVC converter 114, and Cb signal are once inputted into the delay memory 115, and take the picture signal from the edit processing section 116, and a synchronization. And the image composition section 124 performs image composition from the output data (V, Cr, Cb) of the delay memory 115, and the output data (V, Cr, Cb) of the image selector 126. Detailed explanation is omitted although there are watermark composition, fitting composition, character composition, etc. in a typical synthetic approach.
[0070] As shown in drawing 11 , the HVC controller 128 is formed for image quality adjustment mode. The HVC controller 128 receives V, Cr, and Cb data, and it is equipped with matrix computing-element 128a which performs the following matrix operation processings so that image adjustment can be independently performed for every H, V, and C signal.
[0071]
[Equation 6]

$$\begin{vmatrix} V \\ Cr \\ Cb \end{vmatrix} = \begin{vmatrix} 1 & 0 & 0 \\ 0 & q*\cos\theta & -q*\sin\theta \\ 0 & q*\sin\theta & q*\cos\theta \end{vmatrix} * \begin{vmatrix} V \\ Cr \\ Cb \end{vmatrix} \quad (6)$$

[0072] Here, q is a saturation adjustment factor and theta is a hue adjustment factor. These multipliers are outputted from the HVC adjustment control section 129, change Mdata (triplet) sent from an image quality monitor control section, and are chosen as a picture signal and real time from eight kinds of multiplier groups as a signal. Thus, adjustment similar to human being's sensation is performed, and image adjustment according to liking of an operator is made easy.
[0073] (9) Explain surface treatment as an example of the image processing according to the automatic exposure (processing AE) manuscript classification. Conventionally, in the full colour copying machine, since automatic exposure processing had a possibility of becoming the copy of a different color-balance from a manuscript, it was required, without making it operate only in monochrome mode. However, if processing like black alphabetic character distinction is introduced and black and white and a color mixture manuscript come to be vividly reproduced also in the full color mode, it needs to control optimally automatically like automatic exposure processing of manuscript substrate level for prevention of flesh-side projection etc. In this example, the lightness signal (VH) approximated to human being's relative luminous efficiency

(brightness) is created, and histogram generation and a manuscript classification judgment are made. Automatic exposure processing which controls manuscript substrate level automatically and copies it, without not changing the hue of a full color manuscript and being conscious of black and white / color part by this is performed. That is, optimization of substrate level is attained by performing processing also with the most important full color mode and monochrome mode by once changing a picture signal into V, Cr, and Cb signal from R, G, and B signal, performing automatic exposure processing and changing into R, G, and B signal again to the data. Furthermore, in order not to add any processing in the full color mode to Cr and Cb which are a color component signal, either, change of the color-balance by automatic exposure processing does not arise.

[0074] If it explains still more concretely, the preparation of surfaces will be performed by automatic automatic exposure processing or manual setting out. In the basic operation screen of drawing 4 , a user can choose whether to perform automatic exposure processing and whether to choose one level of eight steps of manual assignment. In automatic exposure processing, preliminary scan actuation performs five sorts of manuscript classification (a color criterion (substrate white, substrate coloring) / photograph manuscript, and monochrome criterion / photograph manuscript) from manuscript histogram information (refer to drawing 9). Lightness gradation assistant nature if it is a color standard manuscript (substrate white) or monochrome standard manuscript as already shown in drawing 9 , as shown in drawing 12 and drawing 13 is performed, and if it is other manuscript classification, automatic selection of the manual central level setting will be made.

[0075] In the (automatic exposure AE) processing section 130, substrate clearance is performed based on the manuscript classification information acquired in the histogram generation section 110. Here, about manuscript classification (b) and (d), using look-up table memory (AE table) 131a about Lightness V, the lightness signal (Vout) after automatic exposure processing is searched for by the following correction formula from the lightness signal (Vin) before automatic exposure processing, and lightness amendment is performed. That is, it is [0076] to a monochrome standard manuscript.

[Equation 7]

Vout=256*(Vin-b-8)/{(a-8)-b} (7

Moreover, it is [0077] to a color standard manuscript (substrate white).

[Equation 8]

Vout=256*(Vin-8)/(a-8) (8)

a shows substrate level here and b is alphabetic character level. In other words, as shown in drawing 12 , to monochrome standard manuscript, it is made deep, and it is easy to read a thin alphabetic character like pencil writing, and it is copied at the same time it flies a substrate. For this reason, the lightness between a+8 and b is expanded to 0-255, and the upper data Vin are thrown away from a+8 to the bottom, and b. On the other hand, with the color standard manuscript, it is only supposed that it is to fly a substrate. To a color standard manuscript, as shown in drawing 13 , the data Vin between 8 and b are expanded to 0-255, and the upper data are thrown away from b. In this example, the level which flies a substrate was set up with 0-8.

[0078] In black and white / color standard manuscript, it asks for the substrate level a and the alphabetic character level b as follows. The following values are calculated from the lightness histogram h1 of the whole manuscript in the 1st histogram memory 202 (n). First, in order to judge the substrate level of a manuscript, it asks for the gradation level m from which h1 (n) obtains the maximum frequency in the range of n=136-255 (less than [ID 0.4]). And it considers as a=m -8 and substrate lightness is set to 255. Similarly, only at the time of monochrome manuscript, in order to judge the gradation level in a manuscript, it asks for the gradation level l from which h1 (n) obtains the maximum frequency in the range of n=0-120 (more than ID 0.4). And it considers as b=l +8 and is made lightness =0 of the alphabetic character section. It is considering as a=m -8 for flying the gradation near level m certainly near level m, using the variation as **8, since histogram distribution is carrying out normal distribution with a certain variation. Similarly, it is considering as b=l +8 for making gradation near level l into black certainly. Moreover, it does not control by the color copy canonical mode by b because an alphabetic character is not necessarily black.

[0079] Here, in order to carry out through [of the color component of Cr and Cb] (the AE tables 131b and 131c Din=Dout), the color information on a manuscript is controlling shade Information (V), without making it change. For this reason, it can perform regulating [of substrate level] automatically, without changing the color information on a color copy. About a color-difference signal Cr and Cb component, in order not to amend (Vout=V), a color-balance does not collapse.
[0080] Furthermore, in manual setting out (automatic exposure processing discharge) set up with a control panel 154, lightness amendment for carrying out adjustable [of the substrate level value] can be performed. These modes differ by monochrome / color, and a photograph/canonical mode, and the manual set point is seven steps and he is trying for +1 and +2 to become in the direction to which, as for -1--4, a substrate flies focusing on **0 in the direction to fog (refer to drawing 4). the detailed content of setting out is shown in a table 2 in a color canonical mode, a monochrome canonical mode, and photograph mode -- as -- manual setting out -- each -- level +2--4 are set up.
[0081] As other image processings corresponding to manuscript classification, there is black alphabetic character distinction processing (color blot amendment) in the MTF amendment section 148. As shown in a table 1, this processing is made about a color standard manuscript. When a color picture and monochrome image are intermingled, this is performed in order to optimize the image rendering of a black alphabetic character. First, in the part judged to be the edge section of a black alphabetic character by the field distinction section 146, the data of C, M, and Y component are attenuated, and they carry out edge enhancement, the data of Bk component adding the data of Lightness V to Bk100% of data, and fattening an alphabetic character a little.
[0082] (10) In the reverse HVC conversion reverse HVC converter 132, in order to change into R, G, and B signal from V, Cr, and Cb signal again, perform as the following the inverse-matrix operation of the matrix mentioned above, and output R, G, and B.
[0083]
[Equation 9]

$$\begin{vmatrix} R \\ G \\ B \end{vmatrix} = \begin{vmatrix} 1 & 0.68359375 & 0 \\ 1 & -0.328125 & -0.0390625 \\ 1 & 0 & 0.97265625 \end{vmatrix} * \begin{vmatrix} V \\ Cr \\ Cb \end{vmatrix} \qquad (9)$$

[0084] Although processing of above-mentioned scanning data was changed into lightness data and performed, data processing, such as subsequent color correction, can be performed about data in three primary colors by performing reverse HVC conversion here.
[0085] In drawing 14 , false saturation and a lightness signal required for distinction processing of the next step are created from R and G which were transmitted from the reverse HVC transform-processing section, and B data (R, G, B). A saturation signal (W7-0) is the same as that of what was stated in the UCR/BP processing section, and is created according to the difference (MAX(R, G, B)-MIN (R, G, B)) of the maximum color of R, G, and B data, and the minimum color. That is, it can be called an achromatic color, i.e., monochrome image component, so that it is so small that W7-0 is large of a color picture component with large saturation.
[0086] In the preceding paragraph which asks for this saturation data, the phase shift by the chromatic-aberration phenomenon of R, G, and B data is amended. Under the effect of the chromatic aberration of a lens, as shown in drawing 29 , a color gap of optical system produces this at the edge of a main scanning direction. Compared with the center section of the lens, an edge condenses (R) inside a long wavelength side with the wavelength of light, and (B) condenses outside a short wavelength side. For this reason, the phase of R, G, and B shifts and an image like a vertical line is condensed by CCD. Although chromatic aberration does not pose a problem by the image of comparatively flat concentration distribution of a color patch etc., it serves as a color gap in the edge ** sections, such as an alphabetic character. In the black alphabetic character distinction processing mentioned especially later, a color blot and an alphabetic character piece generate an incorrect judging in the black edge section around a

lifting alphabetic character.
[0087] For this reason, although a quality lens is called for in PPC using a color CCD, even if it raises the lens engine performance, a lens system becomes large, and equipment including the optical system of a scanner becomes large. Moreover, components difference dispersion of a lens cannot be disregarded, either. For this reason, thinking as an approach of amending this by the image-processing system memorizes beforehand the data (correction factor) which show the condition of chromatic aberration to a main scanning direction in memory etc. for every dot, based on that data, it mixes with a contiguity pixel and R and B data have a method of doubling a phase with G data.
[0088]
R (n) = a1 (n) *R (n-1)+a2 (n) -- *R(n)+a3(n) *R(n+1) G (n) = G(n) B (n) = a3(n) *B(n-1)+a -- 2 (n) *B(n)+a1(n) *B(n+1) n : R from a horizontal-scanning criteria location, G, and the Bdot location a1 (n) -- a2 (n), a3 (n) : By the horizontal-scanning ndot eye correction factor, however this approach, the conditions of the chromatic aberration regular for manufacture dispersion with a lens will differ, it will be necessary to memorize a correction factor beforehand in quest of the condition of chromatic aberration for every machine, and productive efficiency is not good.
[0089] So, in this system, as shown in drawing 14 , the phase compensators 1461-1464 which amend four sorts of chromatic-aberration conditions beforehand are prepared, it asks for the saturation data (the = maximum color-minimum color) of R of each amendment circuit, G, and B data in the saturation detectors 1465-1469, and the smallest data in the saturation data are chosen by the selection circuitry 1471, and it is considering as the saturation data which carried out chromatic-aberration amendment.
[0090]
A horizontal-scanning criteria location side R (n) = [.25*R(n+1) +.75*R (n)] It shifts one fourth dot. G (n) = [G (n)] B (n) =.75*B (n) +.25*B (n-1) A horizontal-scanning criteria location side R (n) = [.125*R(n+1) +.875*R (n)] It shifts one eighth dot. G (n) = [G (n)] B (n) =.875*B (n) +.125*B (n-1) Horizontal-scanning mid-gear R (n) = [R (n)] Have no gap. G (n) = G (n) B (n) = [B (n)] Horizontal-scanning criteria location reverse side R (n) =.875*R (n) +.125*R (n-1) It shifts one eighth dot. G (n) = [G (n)] B (n) = [.125*B(n+1) +.825*B (n)] A horizontal-scanning criteria location reverse side R (n) =.75*R (n) +.25*R (n-1) It shifts one fourth dot. G (n) =G (n) B (n) =.25*B(n+1)+.75*B (n) This is the conditions by which chromatic aberration was amended. -> there is no phase shift of R, G, and B. It is based on the logic that -> MAx(R, G, B)-MIN (R, G, B) is the smallest. by this approach, the saturation data by which chromatic-aberration amendment was carried out are obtained, without boiling dispersion in the lens engine performance for every machine, and being influenced. (Drawing 11) Two or more phase compensators which had the correction factor beforehand decided by this example in this way are prepared, and ask for the saturation data (=MAX(R, G, B)-MIN (R, G, B)) of R of each amendment circuit, G, and B data, and it is not necessary to choose the smallest data in the saturation data, and to take dispersion into consideration the saturation data which carried out chromatic-aberration amendment, then the whole lens.
[0091] This uses that the gap direction of R sensor and B sensor is reverse, and the amount of gaps is almost equal using the property of a chromatic-aberration phenomenon. That is, R data are shifted +1 / n dot to horizontal scanning, and it is what was shifted -1-/n dot about B data at reverse, asks for saturation data, and asks for saturation data different from this based on R and B data which were shifted conversely at one side. Two or more saturation data with which n differs are prepared in this way, and it is the approach of choosing the saturation data of the property nearest to an achromatic color from the inside. 1470 is the false lightness signal creation section. The false lightness signal (V7-0) is used as the minimum color data (MIN (R, G, B)) of R, G, and B data.
[0092] The reason which is using the minimum color value as the false lightness component is having abolished the dependency by the color of a manuscript to the edge judging and isolated-point judging at the time of black alphabetic character distinction or halftone dot distinction. The minimum color of R, G, and B data is a color component with the highest concentration in R, G, and B data. Therefore, originally the minimum value of R, G, and B shows colors, such as high yellow of lightness, a color with which blue low lightness, and the same gradation level property

as black. For this reason, an edge judging and an isolated-point judging can carry out compared with an original lightness signal, without being influenced by saturation and ****.
[0093] Drawing 15 is a flow chart for changing automatically the criteria (judgment) level for field distinction of this invention according to the image formation conditions which a user sets up.
[0094] In drawing, by S309, the substrate level set up is judged and the value of the substrate level adjustment value AX is set up S301-S308 according to the judged substrate level. Next, in S309, if an edge reference in case a preparation-of-surfaces value is 256 is set to ER, new edge reference data in case a preparation-of-surfaces value is AX will be calculated, and it will set up with ER* (AX/256). Thus, ER set as the edge judging comparator 1-4 which determines whether to be the edge section of an image EDGREF 17-10, 27-20, 37-30, and 47-40 interlock according to AE level and manual preparation-of-surfaces level which were stated in the air entrainment section. This is because the amount of alphabetic character edges is determined by the line contrast from white criteria (gradation 255 level). In addition, although this example only showed changing the edge reference of a primary differential filter, it cannot be overemphasized that the edge reference of a secondary differential filter is also changed automatically. Black alphabetic character distinction processing is performed by similarly controlling automatically as follows the content of the WREF table which determines the reference level of "a black judgment." namely, a saturation judging reference (WREF table) in case a preparation-of-surfaces value is 256 in S310 — as the function of the false lightness signal of input data — BR (V) ** — if it carries out, a new WREF table in case a preparation-of-surfaces value is AX will be set up with BR (V*256/AX). Thus, the relation of the criteria data made automatic . modification, edge data, and saturation data is shown in drawing 16 (A) and (b). the result of having returned to drawing 15 again and having carried out the multiplication of the scale factor (RX) of a main scanning direction, and the scale factor (RY) of the direction of vertical scanning in S311 — one or less, i.e., a scale factor, — cutback ******** — judging — the case of a cutback — S312 — halftone dot number data AMICNT 7-0 from — It is carrying out adjustable [of the judgment level at the time of making it binary with an isolated-point number judging comparator (CNTREF 27-20)] to the copy assignment scale factor. namely, judgment level CNTREF27-20=CX of actual size it is — if — the rates RX and RY of variable power of the Lord and the direction of vertical scanning — responding — CNTREF27-20 = CX/(RX*RY) CPU calculates and it resets to an isolated-point number judging comparator. However, it does not carry out deer adjustable [of this] at the time at the time of a cutback copy (RX*RY<1) (S312). At the time of amplification, since it is hard to judge the time of a cutback, and reversely with a halftone dot, the moire phenomenon should come out. However, amplification processing is because the moire phenomenon by ****** tends to be lost and it stops needing adjustable [by the scale factor], in order that reading resolution may go up.
[0095] (b-11) Field distinction section drawing 17 and drawing 18 are drawings showing distinction of the black alphabetic character part in a manuscript image, and the configuration of the field distinction section 1500 which performs distinction processing of a halftone dot field.
[0096] Black alphabetic character distinction is classified into four processings of "generation of a black edge regenerative signal" performed in order to improve the repeatability of a black alphabetic character in "a judgment of an alphabetic character (edge)", "a black judgment", "an extract of the field according to black alphabetic character misjudgment", and the MTF amendment section 1600 explained later, if it divides roughly. Hereafter, these four processings are explained.
[0097] (b-11-1) The judgment alphabetic character of an alphabetic character (edge) is realized from the element of two parts of "poor coating" fundamentally inserted into an "edge part" and its edge part. Moreover, in the case of an insensitive alphabetic character, it becomes only an edge. That is, the judgment of an alphabetic character is attained by judging an edge.
[0098] Lightness signal V7-0 created by the HVC converter 1100 is inputted into the line memory 1502 through the N/P pars inflexa 1501. The N/P pars inflexa 1501 reverses and outputs the data inputted when -NEGA signal inputted was "L." Here, -NEGA signal is an optional signal set up by the user by the negative / positive reversal key 76 of a control panel 25.
[0099] The data by which reading appearance is carried out from the line memory 1502 are

inputted into the secondary differential filter 1508 while they are inputted into the primary differential filter 1503 of the main scanning direction which becomes from 5x5 matrices, respectively, and the primary differential filter 1504 of the direction of vertical scanning. Here, the both sides of a primary differential filter and a secondary differential filter are used for the judgment of an edge because the following descriptions are in each filter.
[0100] Drawing 19 (a) shows lightness distribution of five lines where sizes differ, and it serves as a thick line as it goes to drawing Nakamigi. Drawing 19 (b) is drawing showing the primary differential result of each above-mentioned line. Moreover, drawing 19 (c) is drawing showing the secondary differential result of each above-mentioned line. As understood in drawing, a primary differential filter outputs a detection value higher than a secondary differential filter in the edge part of a thick line (4 or more dots of width of face). On the other hand, a secondary differential filter outputs a detection value higher than a primary differential filter in the edge part of a thin line (less than 4 dots of width of face). That is, the primary differential filter fits detection of the thick edge part of 4 or more dots of width of face, and the secondary differential filter fits detection of the edge part of the thin line of less than 4 dots of width of face.
[0101] In the field distinction section 1500 of this example, paying attention to the description concerned of each filter, when the differential value of either a primary differential filter and a secondary differential filter exceeds each predetermined threshold, it judges with it being an edge part. This is not based on the size of a line but a fixed edge detection precision is maintained.
[0102] (b-11-1-1) The data by which reading appearance is carried out from the line memory 1502 shown in primary differential filter drawing 17 are inputted into the primary differential filter 1503 of the main scanning direction which consists of 5x5 matrices, and the primary differential filter 1504 of the direction of vertical scanning. The filter which shows the primary differential filter 1503 of a main scanning direction to drawing 20 is used. Moreover, the filter which shows the primary differential filter 1504 of the direction of vertical scanning to drawing 21 is used. The differential result searched for with the each primary differential filters 1503 and 1504 is inputted into the following computing elements 1505 and 1506, and the absolute value is calculated. Here, the absolute value of a primary differential result is calculated because a negative multiplier exists in the primary differential filter 1503 shown in drawing 20 and drawing 21 , and 1504. As for the absolute value of a primary differential result with the primary differential filters 1503 and 1504, the average is calculated in the following computing element 1507. Thus, the average is calculated for taking the primary differential result of the both sides of a main scanning direction and the direction of vertical scanning into consideration. Thus, the calculated average values 17-floor lines 10 are inputted into each of the edge judging comparators 1521, 1524, 1526, and 1528 shown in drawing 18 .
[0103] (b-11-1-2) The data by which reading appearance is carried out from the line memory 1502 shown in secondary differential filter drawing 17 are inputted also into the secondary differential filter 1508. The filter which shows the secondary differential filter 1508 to drawing 22 is used. As for the secondary differential results 7-D 0, absolute values 27-floor lines 20 are calculated by the computing element 1509. This is because the multiplier [same with the above-mentioned primary differential filter] negative in a filter exists. These absolute values 27-floor lines 20 are inputted into each of the edge judging comparators 1522, 1523, 1525, and 1527 shown in drawing 18 . Moreover, the secondary differential results 7-D 0 are inputted into the VMTF table 1512. Drawing 2929 is drawing showing the VMTF table 1512. The VMTF table 1512 outputs the lightness edge components 7-VMTF 0 corresponding to the secondary differential results 7-D 0 inputted.
[0104] (b-11-1-3) The edge distinction comparator 1521 shown in edge judging drawing 18 compares the primary differential results 17-floor lines 10 with the 1st edge reference level 17-EDGref 10. Here, the signal of "L" is outputted when the primary differential results 17-floor lines 10 are bigger than the 1st edge reference level 17-EDGref 10. Moreover, the edge distinction comparator 1522 compares the secondary differential results 27-floor lines 20 with the 2nd edge reference level 27-EDGref 20. Here, the signal of "L" is outputted when a secondary differential result is bigger than the 2nd edge reference level 27-EDGref 20. The judgment result in the edge judging comparators 1521 and 1522 is inputted into the AND gate

1533. The AND gate 1533 outputs -EG signal of "L" which means that it is an edge part, when the signal of "L" is received from at least the edge judging comparator 1521 or one side of 1522.

[0105] (b-11-2) The judgment of black judgment black is performed based on the value of saturation data W7-0. That is, when the value of saturation data W7-0 is below a predetermined reference value, this is judged to be black. However, although the value of saturation data W7-0 is a black pixel, it may turn into a big value. For example, in spite of being a black pixel when the phase of the data of R, G, and B ** shifts slightly as the oscillation at the time of reading of the image data of CCD series 14 shows to the drawing 23 upper case, as shown in the drawing 23 lower berth, the value of saturation data W7-0 becomes large. In this case, if black is judged on the above-mentioned criteria, a misjudgment law will be carried out to it being a color pixel.
[0106] In this example, after inputting into the line memory 1514 first saturation data W7-0 calculated by the HVC converter 1100 and making it the data of 3x3 matrices, smoothing processing is performed using the smoothing filter 1515 shown in drawing 24 R> 4. The saturation data 7-WS 0 with which smoothing processing was performed are changed into a gently-sloping value as shown in the drawing 23 lower berth. Thereby, the above-mentioned incorrect judging is avoided.
[0107] The saturation data 7-WS 0 with which smoothing processing was performed are compared with the saturation reference data 7-WREF 0 by the saturation judging comparator 1529 shown in drawing 18 . It judges with the pixel with these saturation data 7-WS 0 being black when the value of the saturation data 7-WS 0 is smaller than the value of the saturation reference data 7-WREF 0. In this case, a comparator 1529 outputs -BK signal of "L" to the OR gate 1537.
[0108] The above-mentioned saturation reference data 7-WREF 0 input into the WREF table 1513 lightness data V7-0 inputted into the line memory 1502, and obtain it. As shown in drawing 25 , the WREF table 1513 is characterized by making the value of WREF 7-0 small in proportion to the brightness, when lightness data V7-0 is brighter than a predetermined value. This takes into consideration that the black pixel produced by incorrect judging is conspicuous in the bright part of lightness.
[0109] As mentioned above, -BKEG signal of "L" which means that the pixel to which the alphabetic character (edge) judging and the black judgment were performed is a pixel of an edge part (-EG signal is "L"), and is a black pixel (-BK signal is "L"), and the OR gate 1537 is an edge part with the black pixel concerned when -BKEGEN signal is "L" is outputted.
[0110] (b-11-3) Only by the extract above-mentioned alphabetic character (edge) judging of the field according to black alphabetic character misjudgment, and black judgment, the value of the saturation data 7-WS 0 may also use a low (for example, deep blue and a dark green color) alphabetic character as the edge part of a black alphabetic character a misjudgment exception low [the value of lightness data V7-0].
[0111] Moreover, as shown in drawing 26 , in the part where the image corresponding to the opposite color, such as cyanogen and yellow, adjoins each other, the value of saturation data W7-0 once becomes low in the change part of the color. That is, the part which changes black in the part of a change of a color is generated. Only by the above-mentioned alphabetic character (edge) judging and black judgment, this part will be judged accidentally [be / it / the edge part of a black alphabetic character]. When a misjudgment law is carried out to it being an edge part, a black line will be drawn on a change of cyanogen and the color of yellow. When a blue alphabetic character is printed by the yellow substrate with the cover of a journal etc., it is easy to generate such a case.
[0112] In this example, in order to cancel the above-mentioned technical problem as extract processing of the field according to black alphabetic character misjudgment, a color poor part is distinguished. And even if it is the case where it is judged with the above-mentioned black alphabetic character, that judgment is canceled about the part judged that is this color poor part. The judgment of a thereby more positive black alphabetic character is realized.
[0113] A color poor part is the non-edge section, is the pixel of color mode area and is characterized by a pixel with still lower lightness existing within the limits of predetermined more than fixed level. Based on this description, the judgment of the color poor section is performed

as follows. As a result of a primary differential filter, in the edge judging comparators 1523 and 1524, floor lines 27-20 output -BETA1 signal of "L" which means that the OR gate 1534 is the pixel of the non-edge section as a result of floor lines 17-10 and a secondary differential filter, when lower than the value of the 3rd edge reference level 37-EDGref 30 and the 4th edge reference level 47-EDGref 40. Moreover, in the saturation judging comparator 1530, when the value of the saturation data 7-WS 0 is smaller than the predetermined reference values 27-WREF 20, a comparator 1530 outputs -COL signal of "L" which means that this part is color data. Furthermore, the lightness judging comparator 1531 outputs -VL1 signal of "L", when the value of lightness data V17-10 is smaller than the predetermined reference values 17-Vref 10. The OR gate 1538 outputs -CAN signal of "L" which means that the pixel concerned is the non-edge section, and it is the pixel of color mode area, and is a pixel with still lower lightness to the input of -BETA1 signal of "L", -COL signal, and -VL1 signal, respectively. It is considered that this part is the chromatic color flat part of a non-background. The following counter 1542 counts the number of -CAN signals of "L" per 9x 9 pixels. The count judging comparator 1543 outputs -BKEGON signal of "L", when the value of the count result data 15-Cnt 10 inputted from a counter 1542 is smaller than reference values 7-Cntref 0.

[0114] The above-mentioned -BKEG signal and -BKEGON signal are inputted into the OR gate 1544. The above-mentioned BKEG signal is delayed by the delay circuit 1541 so that the signal about the same pixel may be inputted into the OR gate 1544. Even if it is the case where -BKEG signal of "L" which expresses the judgment result that it is the black edge section to the OR gate 1544 is inputted, color data exist within the limits of predetermined beyond a predetermined reference value, when it is judged that it is a color poor part, -BKEGON signal of "H" is inputted, judgment that it is the edge section of the above-mentioned black is canceled, and -PAPA signal of "H" is outputted. In this example, only when the black alphabetic character is drawn on the substrate of an achromatic color, edge enhancement processing is performed. Moreover, when the pixel judged within the limits of predetermined to be a color poor part does not fulfill a predetermined reference value, judgment that it is a black edge part is maintained, and -PAPA signal of "L" is outputted.

[0115] (b-11-4) As shown in distinction drawing 17 of a halftone dot field, the data outputted from the line memory 1502 are inputted into the white halftone dot detection filter 1510 and the black halftone dot detection filter 1511. Each filter receives the average of 2 pixels before and behind eight directions which enclose the attention pixel X as shown in drawing 2727 . An attention pixel a certain level (AMIREF 7-0) — all directions — receiving — being large (white halftone dot), when an attention pixel is larger than eight surrounding pixels in order to judge whether it is small (black halftone dot) and to isolated-point-ize further It judges with a white halftone dot, and (-WAMI="L") and when small still more nearly altogether, it decides with a black halftone dot (-KAMI="L").

[0116] Specifically, the white halftone dot detection filter 1510 shown in drawing 17 outputs -WAMI signal of "L", only when satisfying all the conditional expression that satisfies the monograph affair type shown in the following "-18 number", and is shown in the following "-19 number."

[0117]

[Equation 18] X- (a11+a22) / 2>AMIREF7 - 0X- (a31+a32) / 2>AMIREF7 - 0X- (a51+a42) / 2>AMIREF7 - 0X- (a53+a43) / 2>AMIREF7-0X-(a55+a44)/2>AMIREF7-0X-(a35+a34)/2>AMIREF7-0X-(a15+a24)/2>AMIREF7-0X-(a13+a23)/2>AMIREF7-0[0118 —]

[Equation 19] X>a22X>a32X>a42X>a43X>a44X>a34X>a24X> a23 and the black halftone dot detection filter 1511 output -KAMI signal of "L", only when satisfying all the monograph affair types that satisfy the monograph affair type shown in the following "-20 number", and are shown in the following "-21 number."

[0119]

[Equation 20] X- (a11+a22) / 2<AMIREF7 - 0X- (a31+a32) / 2<AMIREF7 - 0X- (a51+a42) / 2<AMIREF7 - 0X- 0X- (a13+a23) / [0X- (a15+a24) / / 0X- (a35+a34) / / 0X- (a55+a44) / / (a53+a43) / 2<AMIREF7 - / 2<AMIREF7 - / 2<AMIREF7 - / 2<AMIREF7 -] 2<AMIREF 7-0

[0120]

[Equation 21] -WAMI signal and -KAMI signal which were outputted from X<a22 X<a32X<a42

X<a43 X<a44 X<a34 X<a24X<a23 white and the black halftone dot detection filters 1510 and 1511 are inputted into the counters 1550 and 1551 shown in drawing 18 , respectively. Counters 1550 and 1551 count the number of the signals of "L" of each signal within a 41x9-pixel matrix. The counter value outputted from each counters 1550 and 1551 is inputted into the maximum detector 1552. In the maximum detector 1552, the bigger one than that of a counter value which was inputted is outputted as the halftone dot number (Amicnt 7-0). Amicnt 7-0 is inputted into four halftone dot number judging comparators 1553-1556. In each comparators 1553-1556, as shown in drawing 28 , it is made binary by four steps of halftone dot judging reference level (CNTREF 17-10, CNTREF 27-20, CNTREF 37-30, CNTREF 47-40). Each comparators 1553-1556 output the signal (-AMI0, -AMI1, -AMI2, -AMI3) of "L", when Amicnt 7-0 is larger than halftone dot judging reference level (CNTREF 17-10, CNTREF 27-20, CNTREF 37-30, CNTREF 47-40).

[0121] (b-11-5) Input into the lightness judging comparator 1532 which shows other distinction lightness data V7-0 to drawing 18 , and compare with the 2nd lightness reference level 27-VREF 20. Here, in the case of a bigger value than the 2nd lightness reference level 27-VREF 20, lightness data V7-0 outputs -VH1 signal of "L" which means that this part is a highlights part. Moreover, a non-edge part is judged like the case of a black judgment. As a result of a primary differential filter, in the edge judging comparators 1527 and 1528, floor lines 27-20 output -BETA2 signal of "L" which means that the OR gate 1536 is the pixel of the non-edge section as a result of floor lines 17-10 and a secondary differential filter, when lower than the value of the 7th edge reference level 77-EDGref 70 and the 8th edge reference level 87-EDGref 80. The OR gate 1539 outputs the "L" signal meaning the part concerned being a highlights flat part to the input of -VH1 signal of "L", and -BETA2 signal, respectively. This signal is delayed by the delay circuit 1546, and is outputted as a -HLIGHT signal.

[0122] Moreover, as a result of a primary differential filter, as a result of floor lines 17-10 and a secondary differential filter, floor lines 27-20 are inputted into the edge judging comparators 1525 and 1526, and are compared with the 5th edge reference level 57-EDGREF 50 and the 6th edge reference level 67-EDGREF 60, and if large, -EG2 signal of "L" which means that it is the edge section from the AND gate 1535 will be outputted. - EG2 signal is delayed by the delay circuit 1545, and is outputted as a -MAMA signal.

[0123] (b-12) MTF amendment section drawing 30 and drawing 31 are drawings showing the configuration of the MTF amendment section 1600. the field distinction result (it MAMA(s) -AMI0—AMI3 and -) according [the MTF amendment section 1600] to the field distinction section 1500 - The class of pixel recognized by PAPA, -EDG, and -HLIGHT, And based on the printing situation recognized by the condition signal (MODE, -CMY/K, -BKER, -COLER), most suitable edge enhancement processing and smoothing processing are performed to pixel data (MVIDEO 7-0 or VIDEO 7-0). Moreover, according to the class of recognized pixel, the laser luminescence duty ratio in a pixel clock 1 cycle unit is changed. Here, a luminescence duty ratio means the rate of the laser luminescence period at the time of establishing the period which does not carry out laser luminescence, while a pixel clock carries out 1 cycle. Furthermore, a predetermined value is added to the standup of an edge, and the pixel data of a falling part, and the toner in the standup part of the edge produced in case the toner image formed on the photo conductor drum 41 is imprinted in the copy paper sticks too much, and the blur of the toner in a falling part is amended.

[0124] The MTF amendment section 1600 recognizes the color of the toner under current printing processing from -CMY/K signal. - In CMY/K="L", performing printing processing about the toner of C (cyanogen), M (Magenta), and Y (yellow) is recognized. Moreover, in the case of -CMY/K="H", performing printing processing about the toner of BK (black) is recognized. From three signals, MODE, -BKER, and -COLER, moreover, a full color canonical mode (-BKER="H", -COLER="H", MODE=" H"), full color photograph mode "-BKER=" — H" and -COLER= — H", MODE="L" — A mono-color canonical mode (-BKER="H", -COLER="L", MODE=" H"), mono-color photography mode "-BKER=" — H" and -COLER= — L", MODE="L" — it recognizes whether which the mode in a monochrome canonical mode (- BKER — = — " — L — " -COLER — = — " — L — " — MODE — = — " — H") or monochrome photograph mode (-BKER= — "L" and -COLER= — "L" and MODE="L — ") is set up. Based on a field distinction

result, the class of pixel which carries out printing processing Furthermore, the pixel of a highlights flat part (- HLIGHT="L"), The pixel of the non-edge section (-HLIGHT="H", -EDG="H" and -PAPA=" H"), it recognizes any of the pixel of the color edge section (-HLIGHT="H", -EDG="L" and -PAPA=" H"), and the pixel of the black edge section "-HLIGHT=" — H" and -EDG= — "L" and -PAPA= — L" they are. After explaining hereafter the MTF amendment performed about various kinds of pixels at the time of each above-mentioned mode setting, the MTF amendment section 1600 is explained based on the block diagram shown in drawing 30 and drawing 31 .
[0125] (b-12-1) the MTF amendment at the time of full color canonical-mode setting out (-BKER="H", -COLER="H", MODE=" H") — the following table 3 The level of the signal of each data inputted into the MTF amendment parameter control section 1601 at the time of full color canonical-mode setting out, The printing situation which the level of each signal means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter-control section 1601 in this case are displayed.
[0126]
[A table 3]
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($\overline{BKER}$="H", $\overline{COLER}$="H", MODE="H")

CMYK	$\overline{HLIGHT}$	$\overline{EDG}$	$\overline{PAPA}$		DMPX1	DMPX0	$USM_{7\sim0}$	DMPX6	DMPX5	$VIDEO_{17\sim10}$
L	L	—	—	CMYﾓｰﾄﾞﾊｲﾗｲﾄ平坦部	L	H	0	H	L	$FSD_{7\sim0}$
	H	H	H	CMYﾓｰﾄﾞ非ｴｯｼﾞ部	L	H	0	H	H	$SD_{7\sim0}$
	H	L	H	CMYﾓｰﾄﾞ色ｴｯｼﾞ部	H	H	$DMTF_{7\sim0}$	H	H	$SD_{7\sim0}$
	H	L	L	CMYﾓｰﾄﾞ黒ｴｯｼﾞ部	L	L	0	L	H	$MIN_{7\sim0}$
H	L	—	—	BKﾓｰﾄﾞﾊｲﾗｲﾄ平坦部	L	H	0	H	L	$FSD_{7\sim0}$
	H	H	H	BKﾓｰﾄﾞ非ｴｯｼﾞ部	L	H	0	H	H	$SD_{7\sim0}$
	H	L	H	BKﾓｰﾄﾞ色ｴｯｼﾞ部	L	H	0	H	H	$SD_{7\sim0}$
	H	L	L	BKﾓｰﾄﾞ黒ｴｯｼﾞ部	H	L	$VMTF_{7\sim0}$	H	H	$SD_{7\sim0}$

[0127] (b-12-1-1) during printing processing of the toner of BK (black) at the time of full color canonical-mode setting out during printing processing of the black edge section "-HLIGHT=" — H" and -EDG= — "L" and -PAPA= — L" (b-12-1-1-1) BK (-CMY/K="H") About the pixel of the black edge section, the data which added the lightness edge components 7-VMTF 0 to usual image data SD 7-0 are outputted as VIDEO 37-30. Here, the lightness edge components 7-VMTF 0 are used instead of the concentration edge components 7-DMTF 0 for the lightness edge component reacting sensitively to the image edge from a substrate rather than a concentration edge component. Here, when a pixel constitutes a halftone dot image, it responds to that extent (consistency of a halftone dot), and edge strong metering (value of the lightness edge components 7-VMTF 0) is restricted. Generating of the moire produced by this when edge enhancement of the halftone dot image is carried out is prevented.
[0128] (b-12-1-1-2) About the pixel of the black edge section in the printing processing under [C, M, and Y] printing processing (- CMY/K="L") of C, M, and Y, edge enhancement does not carry out but outputs the data 7-MIN 0 of the smallest value within 5x5 or a 3x3-pixel matrix as VIDEO 37-30. Thus, the detailed flash line of C and M which are shown in the part surrounded by drawing 38 (a) with the broken line by making the minimum value data within a predetermined matrix into the image data of C, M, and Y, and Y data is eliminated, and it changes into the condition which shows in the part surrounded by drawing 38 (b) with the broken line. Using the data 7-MIN 0 of the minimum value within a predetermined matrix, although the detailed flash line of C and M which are shown in the part surrounded by drawing 3838 (a) with the broken line, and Y data is eliminated is based on the following reasons.
[0129] the former and the above — in order to eliminate a detailed flash line, there was a copying machine which uses the data which deducted the edge detection result (this example

.floor lines 17-10 or floor lines 27-20) from the value of each image data of C, M, and Y as each image data of C, M, and Y. However, in the above-mentioned conventional copying machine, it was set to 0 to the value of the CMY data of the edge partial circumference of a black alphabetic character, and as shown in drawing 39 (a), the technical problem that a white omission arose occurred on the outskirts of edge partial of a black alphabetic character.
[0130] So, at this example, by using the data 7-MIN 0 of the minimum value within the above-mentioned predetermined matrix, as shown in drawing 3838 (b), only the value of each image data of C, M, and Y inside a black alphabetic character is set to 0. As this shows drawing 39 (b), the black alphabetic character without a white omission by which edge enhancement was carried out can be printed.
[0131] (b-12-1-2) As explained before the color edge section (-HLIGHT="H", -EDG="L" and -PAPA=" H"), in the field distinction 1500 of this example, perform processing of "(b-11-3) an extract of the field according to black alphabetic character misjudgment", and distinguish the edge parts of a color alphabetic character and a black alphabetic character. The MTF amendment section 1600 outputs the usual pixel data 7-SD 0 as VIDEO 37-30 during printing processing of BK toner about the pixel of the color edge section at the time of full color canonical-mode setting out, without performing edge enhancement. Moreover, the data which added the concentration edge component data 7-DMTF 0 to the pixel data 7-SD 0 are outputted as VIDEO 37-30 during printing processing of C, M, and Y. The MTF amendment section 1600 cancels the edge enhancement under BK printing processing to the data of the pixel of the edge part of a color alphabetic character. It eliminates that the perimeter of the alphabetic character by which edge enhancement was carried out by this is bordered black.
[0132] (b-12-1-3) In a highlights flat part (-HLIGHT="L") highlights flat part, don't carry out edge enhancement but use FSD 7-0 to which smoothing processing was performed as image data VIDEO 37-30. Thereby, it is not conspicuous and the noise in the highlights section is carried out.
[0133] (b-12-1-4) In the non-edge section (-HLIGHT="H", -EDG="H" and -PAPA=" H") non-edge section, i.e., the color poor section, don't carry out edge enhancement but output the usual pixel data 7-SD 0 as VIDEO 37-30.
[0134] (b-12-2) the MTF amendment at the time of full color photograph mode setting "-BKER=" — H" and -COLER= — H", MODE="L" — the following table 4 displays the signal level of each data inputted into the MTF amendment parameter control section 1601 at the time of full color photograph mode setting, the printing situation which each signal level means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter control section 1601 in this case.
[0135]
[A table 4]
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($\overline{\text{BKER}}$="H", $\overline{\text{COLER}}$="H", MODE="L")

CMYK	$\overline{\text{HLIGHT}}$	$\overline{\text{EDG0}}$	$\overline{\text{PAPA}}$		DMPX1	DMPX0	USM_{7-0}	DMPX6	DMPX5	$VIDEO_{17-10}$
L	L	–	–	CMYモードハイライト平坦部	L	H	0	H	L	FSD_{7-0}
	H	H	H	CMYモード非エッジ部	L	H	0	H	L	FSD_{7-0}
	H	L	H	CMYモード色エッジ部	H	H	$DMTF_{7-0}$	H	L	FSD_{7-0}
	H	L	L	CMYモード黒エッジ部	H	H	$DMTF_{7-0}$	H	L	FSD_{7-0}
H	L	–	–	BKモードハイライト平坦部	L	H	0	H	L	FSD_{7-0}
	H	H	H	BKモード非エッジ部	L	H	0	H	L	FSD_{7-0}
	H	L	H	BKモード色エッジ部	H	H	$DMTF_{7-0}$	H	L	FSD_{7-0}
	H	L	L	BKモード黒エッジ部	H	H	$DMTF_{7-0}$	H	L	FSD_{7-0}

[0136] (b-12-2-1) at the time of black edge section "-HLIGHT=" — H" and -EDG= — "L" and -PAPA= — L" and color edge section (-HLIGHT="H", -EDG="L" and -PAPA=" H") full color

photograph mode setting In order to make it not spoil the gradation property of the halftone pixel, what added the concentration edge component data 7-DMTF 0 to the data 7-FSD 0 with which smoothing processing was performed is outputted as pixel data 37-VIDEO 30. Suitable edge enhancement is realized by performing such edge enhancement processing, without breaking a gradation property.
[0137] (b-12-2-2) In the highlights flat part (-HLIGHT="L") highlights section, during printing processing of C, M, Y, and BK, edge enhancement does not carry out but outputs FSD 7-0 to which smoothing processing was performed as pixel data 37-VIDEO 30. Thereby, it is not conspicuous and the noise in a highlights part is carried out.
[0138] (b-12-2-3) To the non-edge section (-HLIGHT="H", -EDG="H" and -PAPA=" H") non-edge section, i.e., the color poor section, don't perform edge enhancement processing during printing processing of C, M, Y, and BK, but output FSD 7-0 to which smoothing processing was performed as VIDEO 37-30. This maintains the gradation property of a photograph.
[0139] (b-12-3) the MTF amendment at the time of mono-color canonical-mode setting out (-BKER="H", -COLER="L", MODE=" H") -- the following table 5 The signal level of each data inputted into the MTF amendment parameter control section 1601 at the time of mono-color canonical-mode setting out, The printing situation which each signal level means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter-control section 1601 in this case are displayed.
[0140]
[A table 5]
・モノカラー標準モード

($\overline{BKER}$="H", $\overline{COLER}$="L", MODE="H", $\overline{PAPA}$=Don't Care)

CMYK	$\overline{HLIGHT}$	$\overline{EDGO}$		DMPX1	DMPX0	$USM_{7\sim0}$	DMPX6	DMPX5	$VIDEO_{17\sim10}$
-	L	-	ハイライト平坦部	L	H	0	H	L	$FSD_{7\sim0}$
	H	H	非エッジ部	L	H	0	H	H	$SD_{7\sim0}$
L	H	L	CMYモードエッジ部	L	L	$DMTF_{7\sim0}$	H	H	$SD_{7\sim0}$
H	H	L	BKモードエッジ部	L	H	0	H	H	$SD_{7\sim0}$

[0141] (b-12-3-1) During the printing processing of BK at the time of edge section (-HLIGHT="H" and -EDG=" L") mono-color canonical-mode setting out, don't perform edge enhancement but output the usual pixel data 7-SD 0 as VIDEO 37-30. Moreover, during C, M, and Y printing processing, what added the concentration edge component data 7-DMTF 0 to the usual pixel data 7-SD 0 is outputted as VIDEO 37-30. It prevents that the edge part of a color alphabetic character is bordered black by this.
[0142] (b-12-3-2) In a highlights flat part (-HLIGHT="L") and a non-edge section (-HLIGHT="H" and -EDG=" H") highlights flat part, edge enhancement processing is not performed during printing processing of C, M, Y, and BK, but output FSD 7-0 to which smoothing processing was performed as VIDEO 37-30. Thereby, it is not conspicuous and the noise in a highlights part is carried out. Moreover, edge enhancement does not carry out to the non-edge section, i.e., the color poor section, and edge enhancement processing is not performed during printing processing of C, M, Y, and BK, but FSD 7-0 to which smoothing processing was performed is outputted as VIDEO 37-30.
[0143] (b-12-4) the MTF amendment at the time of mono-color photography mode setting "-BKER=" -- H" and -COLER= -- L", MODE="L" -- the following table 6 displays the signal level of each data inputted into the MTF amendment parameter control section 1601 at the time of mono-color photography mode setting, the printing situation which each signal level means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter control section 1601 in this case.
[0144]
[A table 6]

・モノカラー写真モード

(BKER="H", COLER="L", MODE="L", PAPA=Don't Care)

CMYK	HLIGHT	EDG0		DMPX1	DMPX0	USM7~0	DMPX6	DMPX5	VIDEO17~10
—	L	—	ハイライト平坦部	L	H	0	H	L	FSD7~0
	H	H	非エッジ部	L	H	0	H	L	FSD7~0
L	H	L	CMYモードエッジ部	L	L	DMTF7~0	H	L	FSD7~0
H	H	L	BKモードエッジ部	L	H	0	H	L	FSD7~0

[0145] (b-12-4-1) At the time of edge section (-HLIGHT="H" and -EDG=" L") mono-color photography mode setting, in order to make it not spoil the gradation property of the halftone pixel, use the data 7-FSD 0 with which smoothing processing was performed as pixel data. Emphasis of an edge is performed to data 7-FSD 0 during printing processing of C, M, and Y by adding the concentration edge strong preparation parts 7-DMTF 0. It prevents that the edge part of a color alphabetic character is bordered with doing in this way black.
[0146] (b-12-4-2) In a highlights flat part (-HLIGHT="L") and a non-edge section (-HLIGHT="H" and -EDG=" H") highlights flat part, edge enhancement processing is not performed during printing processing of C, M, Y, and BK, but output FSD 7-0 to which smoothing processing was performed as VIDEO 37-30. Thereby, it is not conspicuous and the noise in a highlights part is carried out. Moreover, to the non-edge section, i.e., the color poor section, edge enhancement processing is not performed during printing processing of C, M, Y, and BK, but FSD 7-0 to which smoothing processing was performed is outputted as VIDEO 37-30.
[0147] (b-12-5) the MTF amendment at the time of monochrome canonical-mode setting out (-BKER="L", MODE=" H") — the following table 7 displays the signal level of each data inputted into the MTF amendment parameter control section 1601 at the time of monochrome canonical-mode setting out, the printing situation which each signal level means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter control section 1601 in this case.
[0148]
[A table 7]
・モノクロ標準モード

(BKER="L", COLER=Don't Care, MODE="H", PAPA=Don't Care)

CMYK	HLIGHT	EDG0		DMPX1	DMPX0	USM7~0	DMPX6	DMPX5	VIDEO17~10
—	L	—	ハイライト平坦部	L	H	0	H	L	FSD7~0
	H	H	非エッジ部	L	H	0	H	H	SD7~0
L	H	L	CMYモードエッジ部	L	L	0	H	H	SD7~0
H	H	L	BKモードエッジ部	H	L	VMTF7~0	H	H	SD7~0

[0149] (b-12-5-1) At the time of setting out of an edge section (-HLIGHT="H" and -EDG=" L") monochrome canonical mode, use the usual data 7-SD 0 as pixel data, and during printing processing of BK, emphasis of an edge adds the lightness edge components 7-VMTF 0 to the above-mentioned data 7-SD 0, and performs them. Edge enhancement is not performed during C, M, and Y printing processing.
[0150] (b-12-5-2) In a highlights flat part (-HLIGHT="L") and a non-edge section (-HLIGHT="H" and -EDG=" H") highlights flat part, edge enhancement processing is not performed during printing processing of C, M, Y, and BK, but output FSD 7-0 to which smoothing processing was performed as VIDEO 37-30. Thereby, it is not conspicuous and the noise in a highlights part is carried out. Moreover, to the non-edge section, during printing processing of C, M, Y, and BK, edge enhancement processing is not performed but the usual data 7-SD 0 are outputted as VIDEO 37-30.

[0151] (b-12-6) the MTF amendment at the time of monochrome photograph mode setting — the following table 8 displays the signal level of each data inputted into the MTF amendment parameter control section 1601 at the time of monochrome photograph mode setting, the printing situation which each signal level means, and each signal level of DMPX0, DMPX1, DMPX5, and DMPX6 which are outputted from the MTF parameter control section 1601 in this case.
[0152]
[A table 8]
・モノクロ写真モード

($\overline{BKER}$="L", $\overline{COLER}$=Don't Care, MODE="L", $\overline{PAPA}$=Don't Care)

CMYK	$\overline{HLIGHT}$	$\overline{EDG0}$		DMPX1	DMPX0	USM_{7-0}	DMPX6	DMPX5	$VIDEO_{17-10}$
–	L	–	ハイライト平坦部	L	H	0	H	L	FSD_{7-0}
	H	H	非エッジ部	L	H	0	H	L	FSD_{7-0}
L	H	L	CMYモードエッジ部	L	H	0	H	L	FSD_{7-0}
H	H	L	BKモードエッジ部	H	H	$DMTF_{7-0}$	H	L	FSD_{7-0}

[0153] At the time of monochrome photograph mode setting, in order to make it not spoil the gradation property of the halftone pixel, the data 7-FSD 0 with which smoothing processing was performed as image data are used. Emphasis of an edge is performed by adding the concentration edge component data 7-DMTF 0 to the data 7-FSD 0 with which the above-mentioned smoothing processing was performed.
[0154] In a highlights flat part and the non-edge section, in order to make it not spoil the gradation property of the halftone pixel, the data 7-FSD 0 with which smoothing processing was performed as image data are used.
[0155] (b-12-7) Explain the MTF amendment which the MTF amendment section 1600 performs based on the configuration of the MTF amendment section 1600 shown in explanation next drawing 30 , and drawing 31 of the MTF amendment section 1600.
[0156] -AMI0 1 bit each signal - -AMI3 signal, -HLIGHT signal, -EDG signal, -PAPA signal, and -MAMA signal are inputted into the MTF amendment parameter control section 1601 from the field distinction section 1500 explained above. Furthermore, a MODE signal 1 bit each, -CMY/K signal, -BKER signal, and -COLER signal are inputted into a control section 1601. A MODE signal is a signal showing the class of manuscript, in the case of photograph mode, is "L", and, in the case of the normal mode, is "H". - It is the condition signal which shows a printing situation, and during the printing processing about the toner of C (cyanogen), M (Magenta), and Y (yellow), a CMY/K signal is "L" and is "H" during the printing processing about the toner of BK (black). - A BKER signal is a signal which requires that signal processing should be performed in monochrome mode. - A COLER signal is a 1-bit signal which requires that signal processing should be carried out by mono-color mode. - A BKER signal and -COLER signal are area signals. As shown in the following "table 9", the MTF amendment parameter-control section 1601 outputs LIMOS, while outputting DMPX0-DMPX6 based on the value of the eight above-mentioned kinds of signals inputted, as shown in above-mentioned "a table 3" - "a table 9."
[0157]
[A table 9]

MODE	$\overline{MAMA}$	$\overline{AMI0}$	LIMOS
"H"	"L"	–	"L"
	–	"L"	"L"
	"H"	"H"	"H"
"L"	–	–	"H"

[0158] A LIMOS signal is a signal which changes the luminescence duty ratio of the laser diode to an image data. Here, a luminescence duty ratio means the rate of the laser luminescence period at the time of establishing the period which does not carry out laser luminescence, while a pixel clock carries out 1 cycle. Moreover, it says that modification of the luminescence duty ratio of a laser diode establishes the nonluminescent period of a predetermined rate into pixel clock 1 period. the luminescence duty generated corresponding to the value of the image data to which drawing 32 is sent synchronizing with a pixel clock -- un--- it is drawing showing 100% of LD driving signal, and LD driving signal restricted to 80% in the luminescence duty ratio by the limit pulse. In LIMOS="L", in this example, a luminescence duty ratio is set up to 100%. Moreover, in the case of LIMOS="H", a luminescence duty ratio is set up to 80%. To the pixel of the edge section (-MAMA="L") of the case of MODE="H", at i.e., the time of canonical-mode setting out, and the halftone dot section (-AMI0="L"), LIMOS="L" is set up so that it may be displayed. Thereby, the repeatability of an edge part or a halftone dot part is raised. On the other hand, at the time of the non-edge section at the time of canonical-mode setting out, and photograph mode setting, a nonluminescent period is established as LIMOS="H". Thereby, it is not conspicuous and the noise between lines produced in a main scanning direction is carried out.
[0159] A MODE signal, -CMY/K signal, -BKER signal, and -COLER signal are inputted into NAND gate 1602 as it is, and -PAPA signal is inputted into NAND gate 1602 after it is reversed. NAND gate 1602 where these five signals were inputted outputs DMPX7 signal to the switch terminal of a selector 1603. A MODE signal, -CMY/K signal, -BKER signal, and -COLER signal are "H", and NAND gate 1602 outputs the signal of "L", only when -PAPA signal is "L." That is, it is the AND gate 1602 at the full color standard copy mode setting-out time, and it outputs the signal of "L" to the switch terminal of a selector 1603 only during BK printing processing of the black edge section. A selector 1603 outputs the concentration data 7-VIDEO 0 to the input of "H" signal, and outputs the lightness data MVIDEO with which masking processing was performed to the input of the "L" signal.
[0160] Image data MVIDEO 7-0 by which masking processing was carried out is inputted into the generator terminal of a selector 1603 in order of C, M, Y, and K, and seven to VIDEO0 data by which concentration conversion was carried out are inputted into a battery terminal in order of C, M, Y, and K. The data outputted from a selector 1603 are inputted into the Laplacian filter 1605, the smoothing filters 1607-1609, the 5x5 matrix minimum value detection filter 1612, the 3x3 matrix minimum value detection filter 1613, and the printer edge amendment section 1615 through the line memory 1604 which forms the data of 5x5 matrices, respectively.
[0161] The Laplacian filter 1605 is a filter shown in drawing 33 , and changes into emphasis data the data of the attention pixel located in the center. The data outputted from the Laplacian filter 1605 are inputted into the following DMTF table 1606. The DMTF table 1606 performs conversion shown in drawing 34 R> 4, and outputs the concentration edge component data 7-DMTF 0. . The smoothing filters 1607-1609 are filters which graduate the data inputted even to an equivalent for 300dpi, 200dpi, and 100dpi, respectively, for example, the filter shown in drawing 35 - drawing 37 is used for them. Each data to which smoothing processing was performed with each filter is inputted into the smoothing filter control section 1610 with the data which have not carried out smoothing. The sharpness change-over signals 2-SH 0 with which the smoothing filter control section 1601 is outputted from the HVC converter 1100 are inputted. These sharpness change-over signals 2-SH 0 are signals set up in the image quality control circuit 1103 shown in drawing 34 . The smoothing filter control section 1610 chooses the data which correspond from the data by which smoothing was carried out with the data and the smoothing filters 1607-1609 of the inputted sharpness change-over signals 2-SH 0 by which smoothing is not carried out according to the value, and outputs them as SD 7-0. Moreover, the sharpness change-over signals 2-SH 0 can switch eight kinds of edge enhancement multipliers 7-ED 0 outputted from the edge enhancement multiplier control section 1611 to real time (every pixel), and can change two or more sharpness up to 8 area simultaneously.
[0162] It is the filter which outputs the minimum value of the data which are in the matrix concerned in the case of having arranged the attention pixel in the center of each matrix with the 5x5 matrix minimum value detection filter 1612 and the 3x3 matrix minimum value detection filter 1613. The minimum value data outputted from the minimum value detection filters 1612 and

1613 are inputted into a selector 1614. A selector 1614 chooses the data of either of the above-mentioned minimum value data by which an input is carried out according to the value of the filter selection signal FSEL2, and outputs them as MIN 7-0. The value of the filter selection signals 7-FSEL 0 is defined experimentally. Thus, the data of an attention pixel, then the insensitive alphabetic character section will be deleted in the minimum value data within a predetermined pixel matrix. That is, the detailed flash line of C and M which are shown in the part surrounded by drawing 38 (a) with the broken line, and Y data is eliminated, and it changes into the condition which shows in the part surrounded by drawing 38 (b) with the broken line. Using the data 7-MIN 0 of the minimum value within a predetermined matrix, although the detailed flash line of C and M which are shown in the part surrounded by drawing 38 (a) with the broken line, and Y data is eliminated is based on the following reasons.
[0163] the former and the above — in order to eliminate a detailed flash line, there was a copying machine which uses the data which deducted the edge detection results [27-floor lines / floor lines and / 20] 17-10 from the value of CMY data as image data of C, M, and Y. However, in the above-mentioned conventional copying machine, it is set to 0 to the value of the CMY data of the edge partial circumference of a black alphabetic character, and as shown in drawing 39 (a), a white omission arises on the outskirts of edge partial of a black alphabetic character.
[0164] So, at this example, by using the data 7-MIN 0 of the minimum value within the above-mentioned predetermined matrix, as shown in drawing 3838 (b), only the value of the CMY data inside a black alphabetic character is set to 0. As this shows drawing 39 (b), the black alphabetic character without a white omission by which edge enhancement was carried out can be printed.
[0165] The printer edge amendment section 1615 performs edge amendment processing in which the printing property produced in case the toner image formed in the photo conductor drum is imprinted to tracing paper was taken into consideration. Here, in the edge section of an alphabetic character, a printing property means a toner becoming blurred conversely and becoming feeling in a part for the trailer of an edge, while more toners in the printing starting position adhere to the toner of tales doses adhering to the both ends of an edge. This has the standup of an edge, or large extent of falling, and when [used as a substrate] it is considered that it starts and the value of the data of a front pixel is about 0, it is generated. On the other hand, edge amendment is performed by adding the data of the field shown with a slash to the data of an edge part with a predetermined data value, as shown in drawing 40 (a). While the amount of the toner which adheres to a form before amendment as a continuous line at drawing 40 (b) is shown, the amount of the toner which adheres to the form after amendment by the dotted line is shown. After amendment, the toner in the standup part of an edge sticks too much, and the blur of the toner in a falling part is mitigated so that it may illustrate.
[0166] Drawing 41 is the block diagram of the printer edge amendment section 1615. A subtractor 1650 calculates the value which deducted the data of eye (L) watch from the data of the pixel of eye watch (L+1), when the data of a main pixel are expressed with (L). Moreover, a subtractor 1651 calculates the value which deducted the data of eye (L) watch from the data of eye watch (L-1). A comparator 1653 outputs the signal of "L" to S0 terminal, when the difference searched for with the subtractor 1650 is bigger than the predetermined reference values 17-REF 10. Moreover, a comparator 1654 outputs the signal of "L" to S1 terminal, when the difference searched for with the subtractor 1651 is bigger than the predetermined reference values 27-REF 20. Moreover, a comparator 1652 compares the data and the reference values REF 37-30 of eye (L) watch. Here, when the value of the data of eye (L) watch is smaller than reference values 37-REF 30, the signal of "L" is outputted to S2 terminal.
[0167] When "L" is inputted into three terminals, S2, S1, and S0, the pixel concerned is in the valley of an edge, as shown in drawing 42 (b), and it turns out that it is data below a predetermined value. In this case, a selector 1655 outputs the addition data 7-PDs 0 as ADD 17-10.
[0168] Moreover, when the signal of "H" is inputted into the terminal of S1 and the signal of "L" is inputted into the terminal of S0 and S2, it turns out that the pixel concerned is the standup part of an edge as shown in drawing 42 (a), and it is a pixel below a predetermined value. In this case, a selector 1655 outputs the addition data 17-PDs 10 as ADD 17-10.

[0169] Moreover, when the signal of "H" is inputted into the terminal of S0 and "L" is inputted into the terminal of S1 and S2, as the pixel concerned is shown in drawing 42 (c), it turns out that it is the falling part of an edge and is a pixel below a predetermined value. In this case, a selector 1655 outputs the addition data 27-PDs 20 as ADD 17-10.
[0170] A selector 1655 outputs the data of a value 0 as ADD 17-10 altogether, when each signal inputted into S2 terminal, S1 terminal, and S0 terminal is except the above-mentioned combination.
[0171] Furthermore, based on the configuration of the MTF amendment section shown in drawing 31 , the MTF amendment which the MTF amendment section 1600 performs is explained.
[0172] As mentioned above, the selector 1616 and selector 1617 to illustrate choose suitable data from the lightness edge component data 7-VMTF 0, the concentration edge component data 7-DMTF 0, or the data of the edge strong metering 0 according to the class of pixel in printing processing, and output them as edge strong preparation part data 7-USM 0. DMPX0 and DMPX1 which are outputted from the MTF amendment parameter-control section 1610 are inputted into a selector 1616 and a selector 1617, respectively. DMPX0 and DMPX1 are outputted as shown in "table 3" - "a table 9" explained above according to the class of pixel during the printing processing at the time of each mode setting.
[0173] Moreover, a selector 1622 and a selector 1623 control and output the edge enhancement multipliers 7-ED 0 based on halftone dot distinction result-AMI0--AMI3 inputted from the field distinction section 1500. The edge enhancement multipliers 7-ED 0 inputted into D terminal of a selector 1622 are signals set up by CPU1, and are a multiplier which controls extent (sharpness) of edge enhancement. Moreover, the data which increased seven to multiplier ED0 signal 1/4 time, 2/4 time, and 3/4 time are inputted into the generator terminal of a selector 1623 - C terminal, respectively. From the MTF amendment parameter-control section 1601, DMPX2 and DMPX3 are inputted into a selector 1622, and DMPX4 is inputted into a selector 1623. DMPX2-DMPX4 are outputted based on the value of -AMI0--AMI3, as shown in the following "table 10."
- When all AMI0--AMI(s)3 are "H" (i.e., when it was not a halftone dot image in the field distinction section 1500 and is distinguished), output to a computing element 1618 as it is by setting the edge enhancement multipliers 7-ED 0 to ED 17-10. As explained above, in the field distinction section 1500, -AMI0, -AMI1, -AMI2, and -AMI3 are switched and outputted to "L" in order according to the degree of a halftone dot becoming high. In the MTF amendment parameter control section 1601, the data inputted into generator terminal - C terminal according to whenever [this halftone dot] are chosen and outputted.
[0174]
[A table 10]
・網点判別処理

$\overline{AMI3}$	$\overline{AMI2}$	$\overline{AMI1}$	$\overline{AMI0}$	DMPX4	DMPX3	DMPX2	$ED_{17\sim10}$
L	L	L	L	L	−	−	0
H	L	L	L	H	L	L	$(ED_{7\sim0})/4$
H	H	L	L	H	L	H	$(ED_{7\sim0})/2$
H	H	H	L	H	H	L	$3\cdot(ED_{7\sim0})/4$
H	H	H	H	H	H	H	$ED_{7\sim0}$

[0175] A computing element 1618 outputs the data which multiply the edge enhancement multipliers 17-ED 10 by the edge strong metering 7-USM 0, and are obtained as edge strong metering 17-USM 10.
[0176] DMPX5 and DMPX6 which are outputted from the MTF amendment parameter-control section 1601 are inputted into a selector 1626 and a selector 1627, respectively. Here, the image data used for printing is chosen from the data 7-MIN 0 outputted from the selector 1614 shown in the data 7-FSD 0 with which the usual pixel data 7-SD 0 and smoothing processing were performed according to the class of pixel in printing processing, and drawing 30 , and is outputted as VIDEO 17-10. DMPX5 and DMPX6 are outputted as shown in "table 3" - "a table

9" explained above according to the class of pixel during the printing processing at the time of each mode setting.
[0177] An adder 1624 adds the edge strong metering 17-USM 10 to the pixel data 17-VIDEO 10, and outputs this as VIDEO 27-20. An adder 1628 adds the addition data 17-ADD 10 outputted to VIDEO 27-20 from the printer edge amendment section 1615, and outputs this as VIDEO 37-30. As explained above, the addition data 17-ADD 10 are data added to the data of the pixel in the standup or falling part of an edge.
[0178] (b-12) The image data after gamma amendment section MTF amendment (VIDEO 37-30) is inputted into gamma amendment section 1700 shown in drawing 43 . In gamma amendment section 1700, according to liking of a user, gamma curve is changed, and is changed and outputted to the data of the image quality for which it asks. VIDEO 37-30 is inputted into gamma amendment table 1702 with gamma curve change-over signals 2-GA 0. gamma curve change-over signals 2-GA 0 are signals set up in the image quality control circuit 1103 shown in drawing 34 . gamma amendment table 1702 can switch eight kinds of gradation curves for gamma curve change-over signals 2-GA 0 to real time as a BANK signal of a table. Eight kinds of this gradation curve is shown in drawing 44 and drawing 45 . Drawing 44 shows the gradation curve corresponding to the value of gamma curve change-over signals 2-GA 0 at the time of light-and-darkness adjustment mode setting. Moreover, drawing 45 shows the gradation curve corresponding to gamma curve change-over signals 2-GA 0 at the time of contrast adjustment mode setting. On gamma amendment table 1702, the data 7-Dout 0 corresponding to the data 7-Din 0 of VIDEO 37-30 are outputted as VIDEO 47-40 according to the gradation curve chosen by gamma curve change-over signals 2-GA 0.
[0179] The operation which shows VIDEO 47-40 outputted from gamma amendment table 1702 to the following "-22 number" in computing elements 1703 and 1704 is performed.
[0180]
[Equation 22] VIDEO77 - 70=(VIDEO47-40-UDC 7-0) xGDC — 7 - 0/128 (however, when a value exceeds 256, referred to as VIDEO77-70=256.), the substrate clearance data 7-UDC 0 and the inclination amendment data 7-GDC 0 are eight kinds of data which the color-balance control section 701 outputs corresponding to COs 2-0 here, as shown in the following "table 13."
[0181]
[A table 11]

	$GDC_{7\sim0}$	$UDC_{7\sim0}$
7	152	0
6	144	0
5	136	0
4	128	0
3	136	16
2	128	16
1	120	16

[0182] Drawing 46 is a graph with which the value of COs 2-0 shows the relation of VIDEO 47-40 and VIDEO 77-70 in 1-7. As shown in drawing 47 , to VIDEO 47-40, the substrate clearance data 7-UDC 0 are removed, and an inclination is amended only for inclination amendment data GDC 7 to 0 minute.
[0183]
[Effect of the Invention] As explained in full detail above, it sets to the 1st invention. It sets to the 2nd invention, without starting the misjudgment exception of a black alphabetic character, since the criteria data for carrying out black alphabetic character distinction according to the set-up gradation property are changed. Since the criteria data for distinguishing a halftone dot field according to the set-up scale factor are changed and an alphabetic character with many halftone dot stroke counts is not made into a halftone dot a misjudgment exception, dotage of an alphabetic character with many such stroke counts, a piece, and a blot can be prevented. Thus,

in any case, it cannot be based on the image formation conditions set up, but a high-definition fixed image rendering can always be maintained.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the graph-sectional view showing the whole digital color copying machine.
[Drawing 2] It is the block diagram of the one section of the signal-processing section.
[Drawing 3] It is the block diagram of the remaining part of the signal-processing section.
[Drawing 4] It is the block diagram of the histogram generation section.
[Drawing 5] It is drawing showing the situation of the sampling in histogram generation.
[Drawing 6] It is drawing showing the various amounts obtained from a histogram.
[Drawing 7] It is the flow Fig. of automatic color selection.
[Drawing 8] It is drawing showing the various amounts obtained from a histogram.
[Drawing 9] It is a flow Fig. for distinguishing image classification.
[Drawing 10] It is drawing for explaining the relation of a lightness signal and various signals (G25-G35).
[Drawing 11] It is drawing of a HVC controller, the (automatic exposure AE) processing section, and the HVC inverse transformation section.
[Drawing 12] It is a graph showing change of the manuscript lightness distribution before and behind the air entrainment to a monochrome color standard manuscript.
[Drawing 13] It is a graph showing change of the manuscript lightness distribution before and behind the air entrainment to a color standard manuscript (substrate white).
[Drawing 14]
[Drawing 15] It is the flow chart which shows the processing which changes the criteria data of this invention automatically.
[Drawing 16] It is drawing showing the effectiveness of this invention.
[Drawing 17] It is drawing showing the configuration of the field distinction section 1500.
[Drawing 18] It is drawing showing the configuration of the field distinction section 1500.
[Drawing 19] (a) shows five lightness distribution of Rhine from which a size differs, (b) is drawing showing the primary differential result of each Rhine of (a), and (c) is drawing showing the secondary differential result of each Rhine of (a).
[Drawing 20] It is drawing showing the primary differentiation filter 1503 of a main scanning direction.
[Drawing 21] It is drawing showing the primary differentiation filter 1504 of the direction of vertical scanning.
[Drawing 22] It is drawing showing the secondary differentiation filter 1508.
[Drawing 23] Since the phase of the data of R, G, and B ** shifted slightly, in spite of being a black pixel, it is drawing which expressed in piles WS 7-0 obtained by showing the case where the value of saturation data W7-0 becomes large, and carrying out smoothing of the saturation data W7-0 concerned.
[Drawing 24] It is drawing showing the smoothing filter 1515.
[Drawing 25] It is drawing showing a WREF table.
[Drawing 26] It is drawing showing the RGB image data of the field which is easy to be made into a black alphabetic character a misjudgment exception and saturation data W7-0, and color-difference signals WR and WB.
[Drawing 27] In the white halftone dot detection filter 1510 and the black halftone dot detection

filter 1511, it is drawing showing the location of 2 pixels before and behind eight directions which enclose the attention pixel X.
[Drawing 28] It is drawing showing four steps of halftone dot judging reference level (CNTREF 17-10, CNTREF 27-20, CNTREF 37-30, CNTREF 47-40), and relation with -AMI0--AMI3.
[Drawing 29] It is drawing showing a VMTF table.
[Drawing 30] It is drawing showing the configuration of the MTF amendment section 1600.
[Drawing 31] It is drawing showing the configuration of the MTF amendment section 1600.
[Drawing 32] It is drawing showing LD driving signal of 100% of luminescence duty ratios generated corresponding to the value of the image data sent synchronizing with a pixel clock, and LD driving signal restricted to 80% in the luminescence duty ratio by the limit pulse.
[Drawing 33] It is drawing showing the Laplacian filter 1605.
[Drawing 34] It is drawing showing the DMTF table 1606.
[Drawing 35] It is the smoothing filter which graduates the data of 400dpi inputted to an equivalent for 300dpi.
[Drawing 36] It is the smoothing filter which graduates the data of 400dpi inputted to an equivalent for 200dpi.
[Drawing 37] It is the smoothing filter which graduates the data of 400dpi inputted to an equivalent for 100dpi.
[Drawing 38] It is shown that C, M, and Y data have protruded (a) from Bk data slightly, and (b) is drawing showing the relation of each data at the time of deleting the flash of the above-mentioned data for the value of C, M, and Y data as the predetermined minimum values 7-MIN 0.

[Drawing 39] (a) expresses the image reproduced on tracing paper, when the relation between Bk data, and C, M and Y data is drawing 39 (a), and (b) expresses the image reproduced on tracing paper, when the above-mentioned relation is drawing 39 (b).
[Drawing 40] (a) is drawing at the time of adding the amendment data shown with a slash to the edge part of image data, and (b) shows the amount of the toner which adheres to the form after amendment by the dotted line while showing the amount of the toner which adheres to a form before amendment as a continuous line.
[Drawing 41] It is drawing showing the configuration of the printer edge amendment section 1615.
[Drawing 42] (a) shows the case where PDs 7-0 are added to the image data of the standup part of an edge, (b) shows the case where PDs 17-10 are added to the image data of the part in the valley of an edge and an edge, and (c) shows the case where PDs 27-20 are added to the image data of the falling part of an edge.
[Drawing 43] It is drawing showing the configuration of gamma amendment section 1700.
[Drawing 44] It is drawing showing gamma amendment table in light-and-darkness accommodation mode.
[Drawing 45] It is drawing showing gamma amendment table in contrast adjustment mode.
[Drawing 46] The value of COs 2-0 is the graph which shows the relation of VIDEO 47-40 and VIDEO 77-70 in 1-7.
[Drawing 47] It is drawing showing change of the graph in the case of removing the substrate removal data 7-UDC 0, and amending an inclination to VIDEO 47-40 only for inclination amendment data GDC 7 to 0 minute.
[Description of Notations]
110 Histogram Generation Section
152 CPU
200 Lightness Creation Section
202 1st Histogram Memory for [All] Pixels
204 2nd Histogram Memory for Chromatic Colors
208 210 Adder for addition
212-218 Circuit for chromatic color discernment
146 Field Distinction Section
1521-1528 Edge judging comparator
1529-1530 Saturation judging comparator

1553-1556 Isolated-point number judging comparator
1 CPU
100 Image Reader Section
1103 Image Quality Control Circuit
1400 Color Correction Section
1600 MTF Amendment Section
1700 Gamma Amendment Section

[Translation done.]

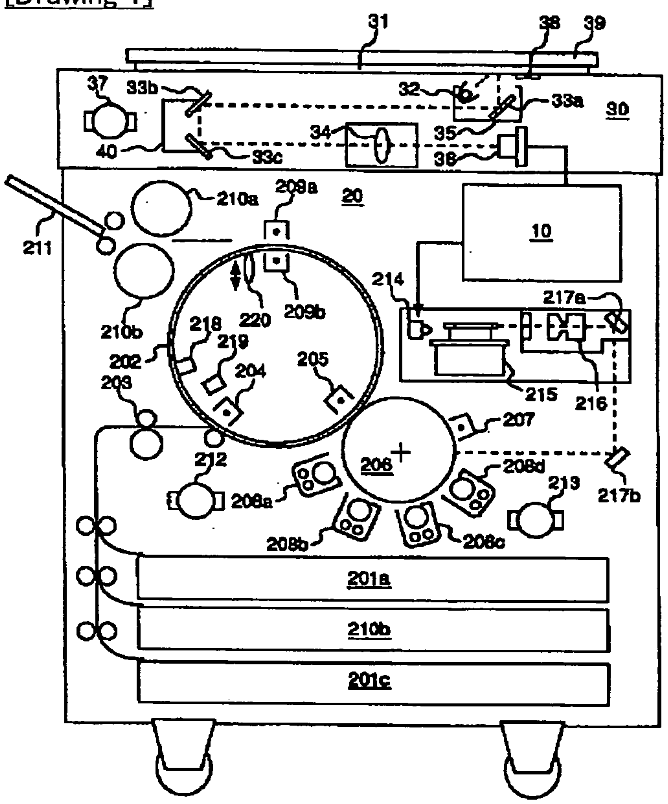
*·NOTICES *

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

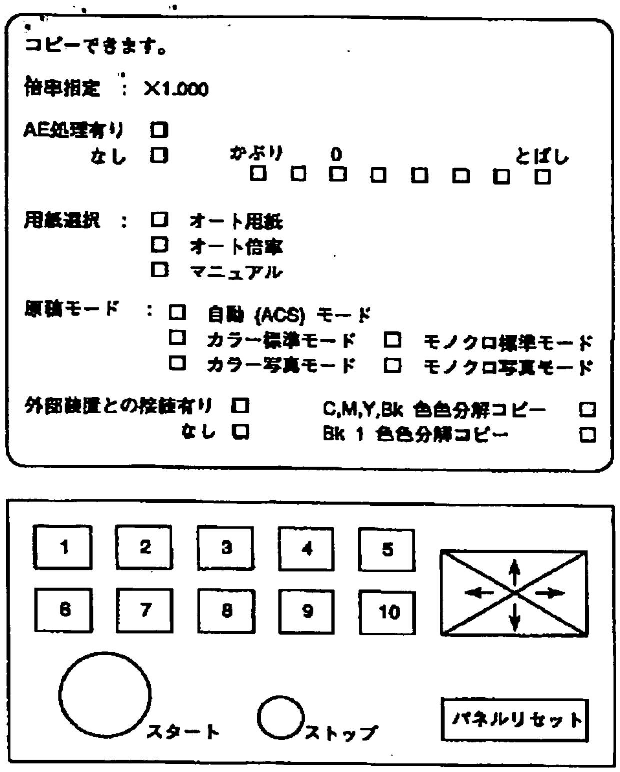
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



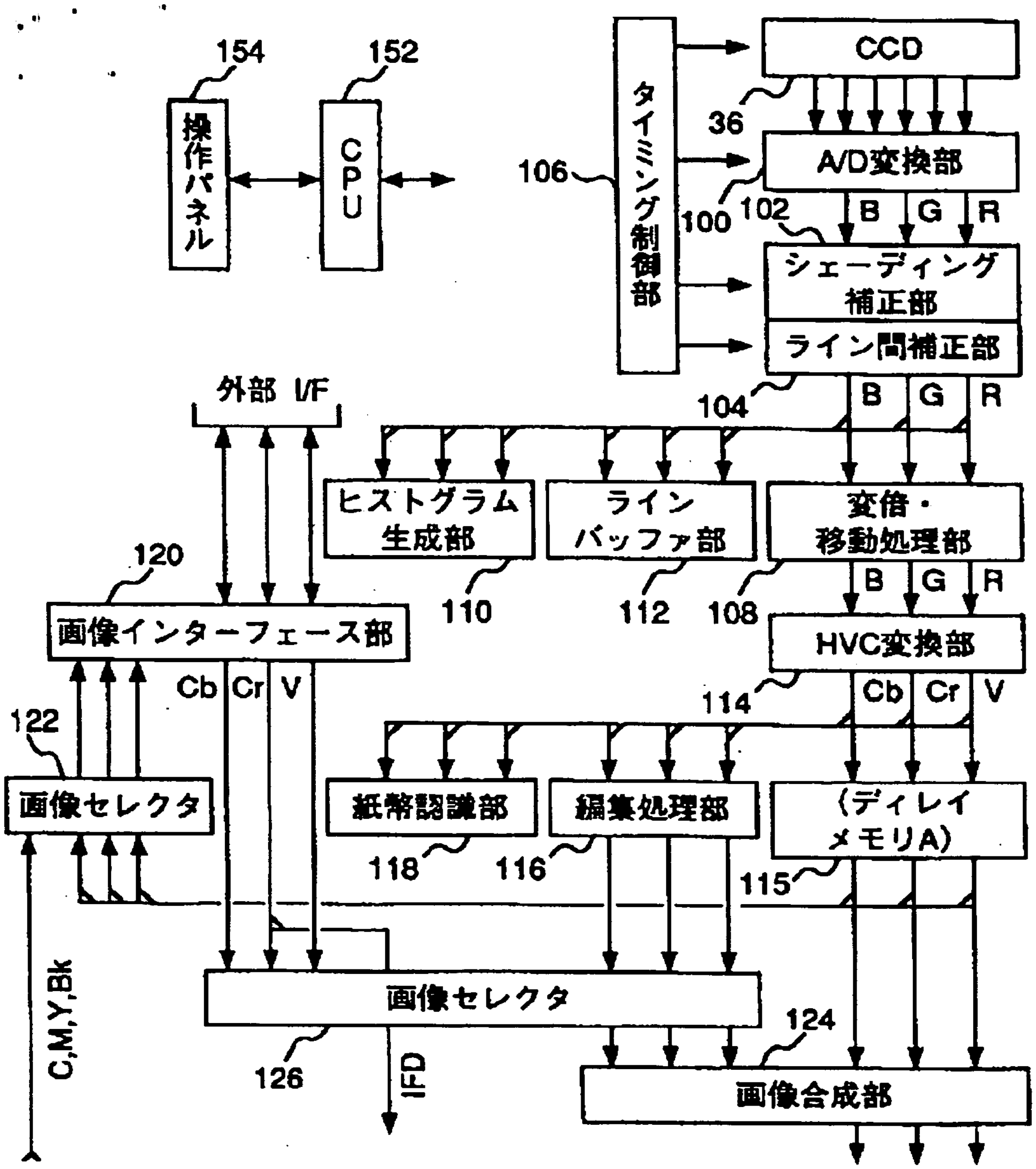
[Drawing 4]



[Drawing 20]

1/8	0	0	0	−1/8
1/8	1/8	0	−1/8	−1/8
1/8	1/8	0	−1/8	−1/8
1/8	1/8	0	−1/8	−1/8
1/8	0	0	0	−1/8

[Drawing 2]



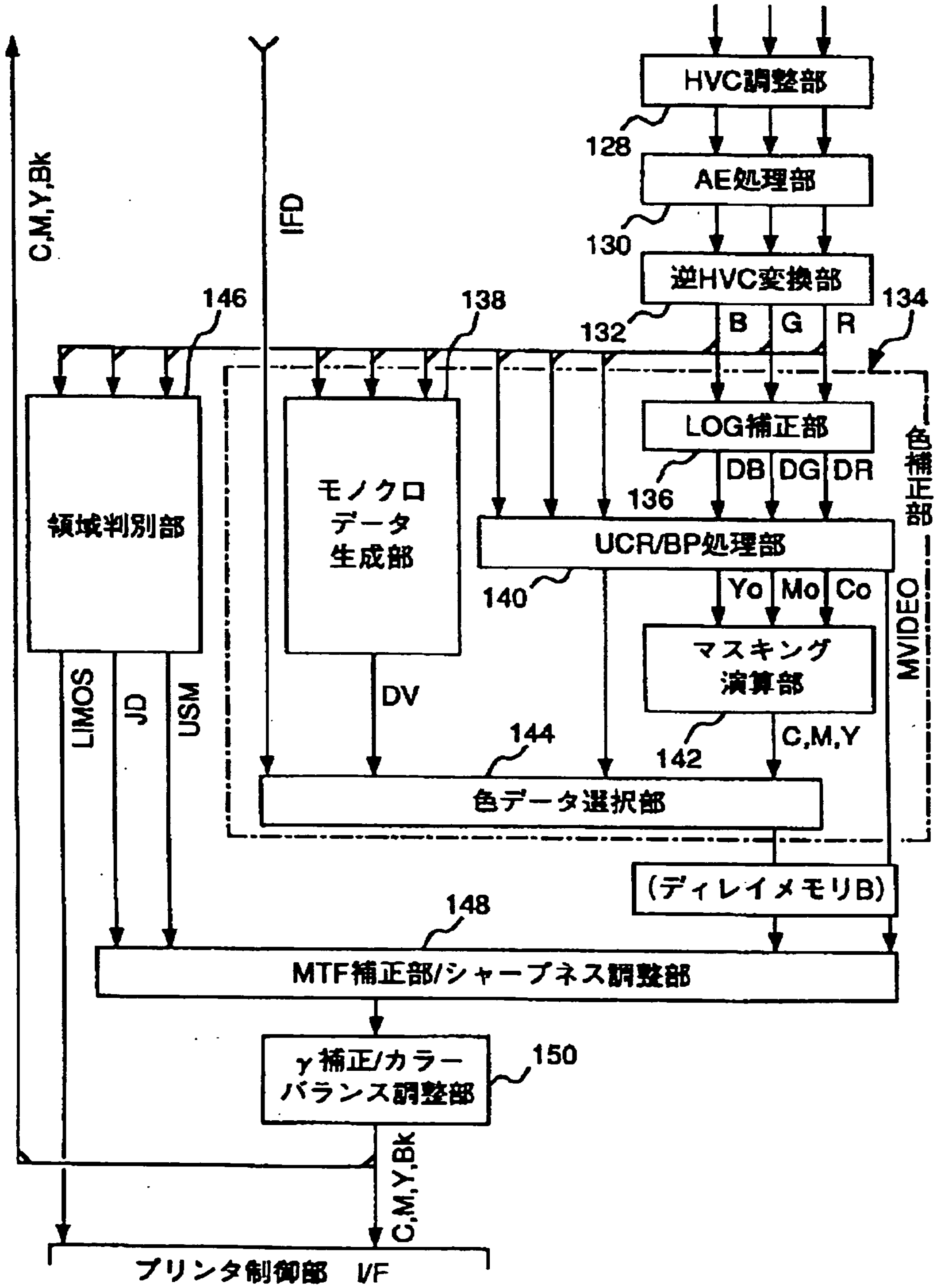
[Drawing 21]

−1/8	−1/8	−1/8	−1/8	−1/8
0	−1/8	−1/8	−1/8	0
0	0	0	0	0
0	1/8	1/8	1/8	0
1/8	1/8	1/8	1/8	1/8

[Drawing 22]

0	0	1/4	0	0
0	0	0	0	0
1/4	0	−1	0	1/4
0	0	0	0	0
0	0	1/4	0	0

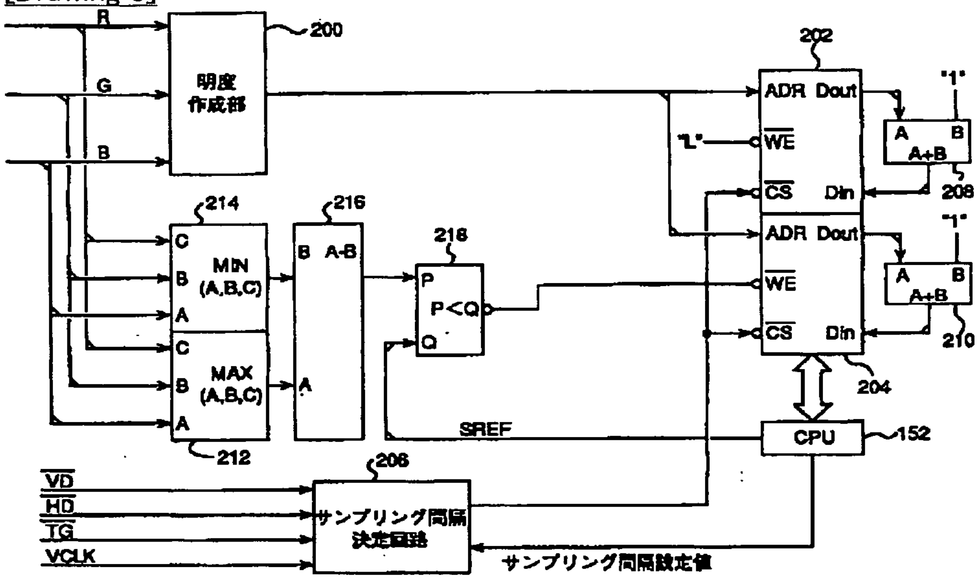
[Drawing 3]



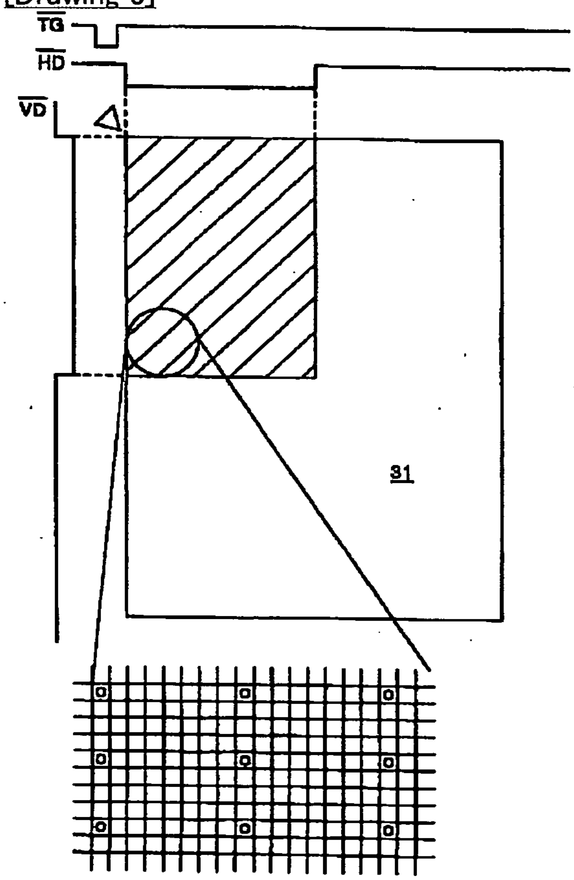
[Drawing 24]

1/16	1/8	1/16
1/8	1/4	1/8
1/16	1/8	1/16

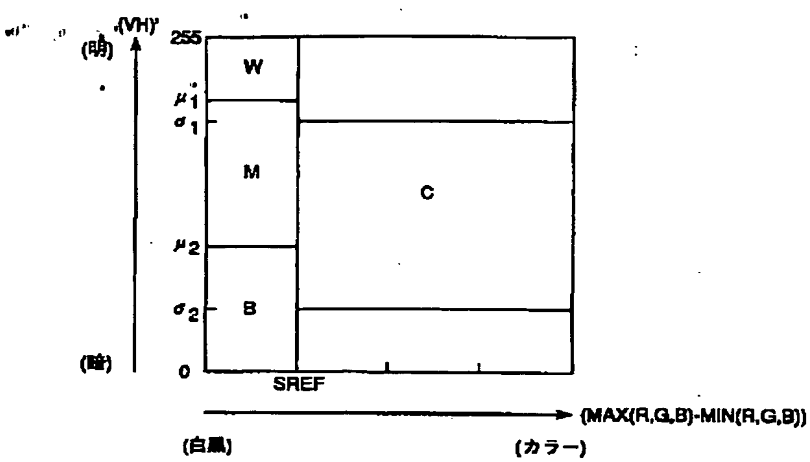
[Drawing 5]



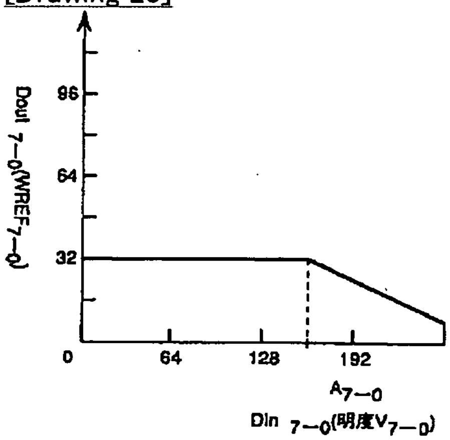
[Drawing 6]



[Drawing 7]



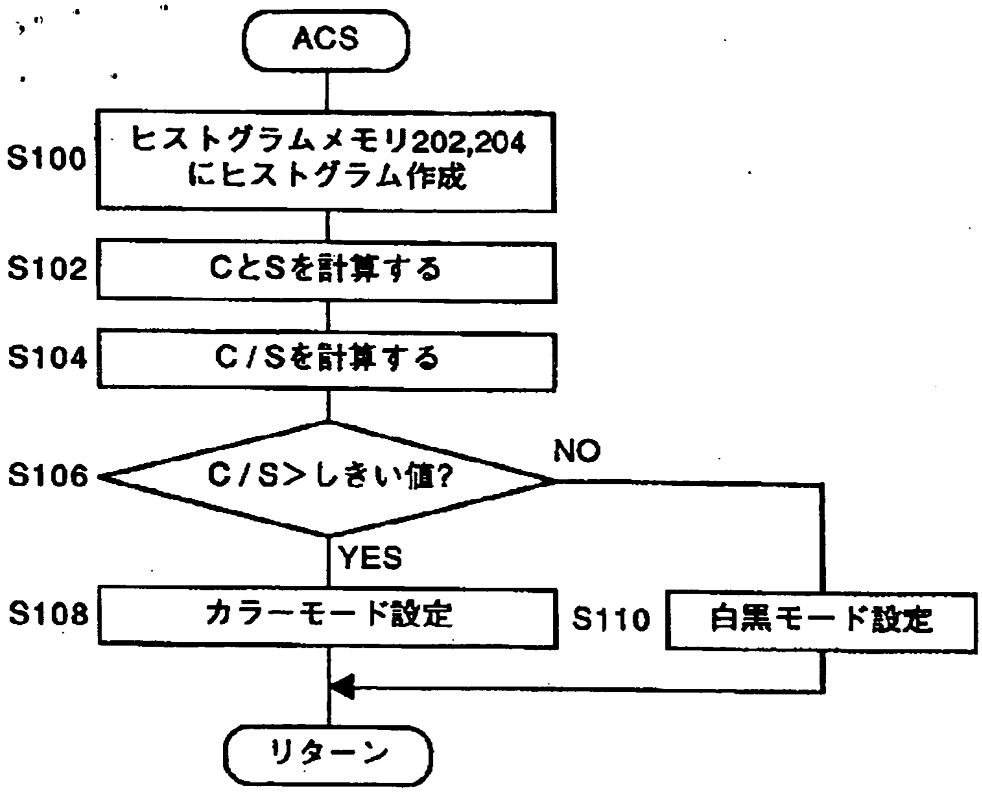
[Drawing 25]



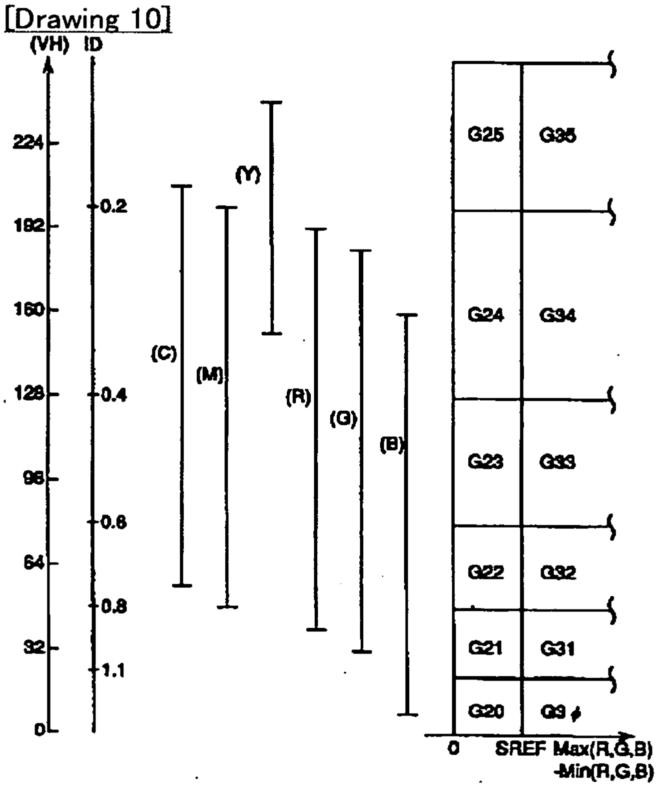
[Drawing 27]

a_{11}		a_{13}		a_{15}
	a_{22}	a_{23}	a_{24}	
a_{31}	a_{32}	X	a_{34}	a_{35}
	a_{42}	a_{43}	a_{44}	
a_{51}		a_{53}		a_{55}

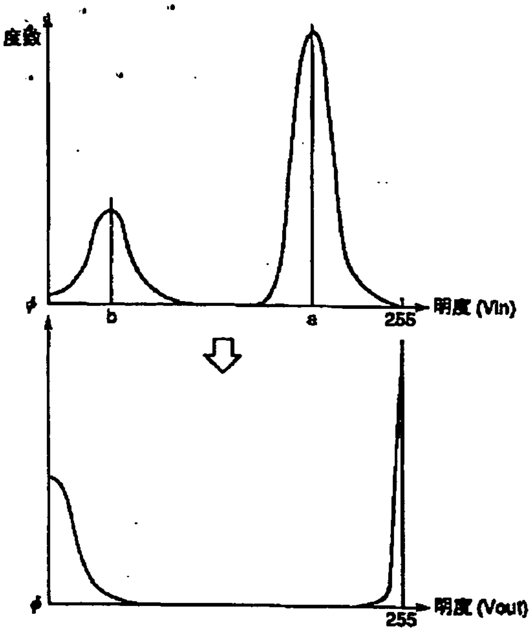
[Drawing 8]



[Drawing 10]



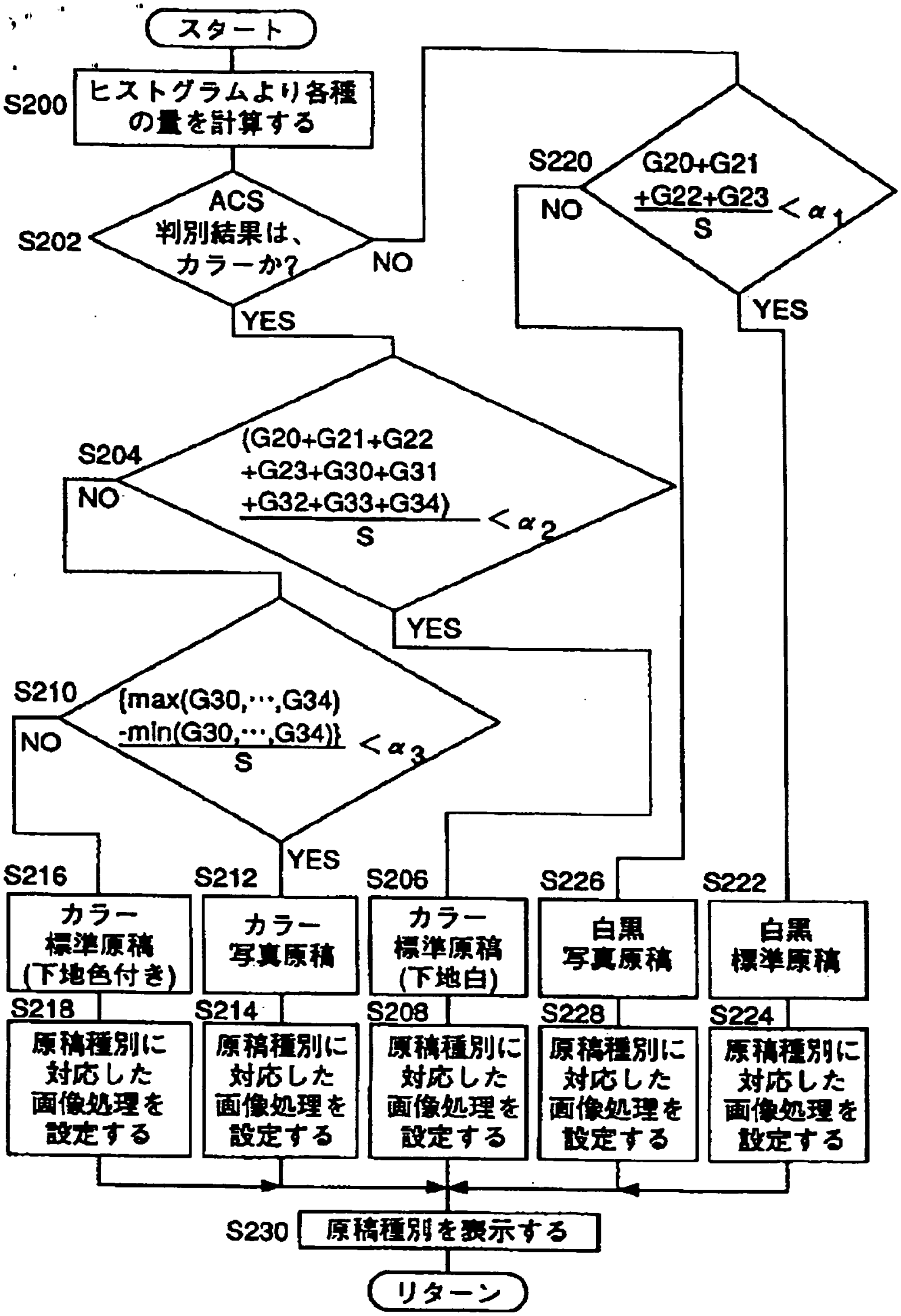
[Drawing 12]



[Drawing 33]

0	0	-1/4	0	0
0	0	0	0	0
-1/4	0	1	0	-1/4
0	0	0	0	0
0	0	-1/4	0	0

[Drawing 9]



[Drawing 35]

1/64	1/32	1/32	1/32	1/64
1/32	1/16	1/16	1/16	1/32
1/32	1/16	1/16	1/16	1/32
1/32	1/16	1/16	1/16	1/32
1/64	1/32	1/32	1/32	1/64

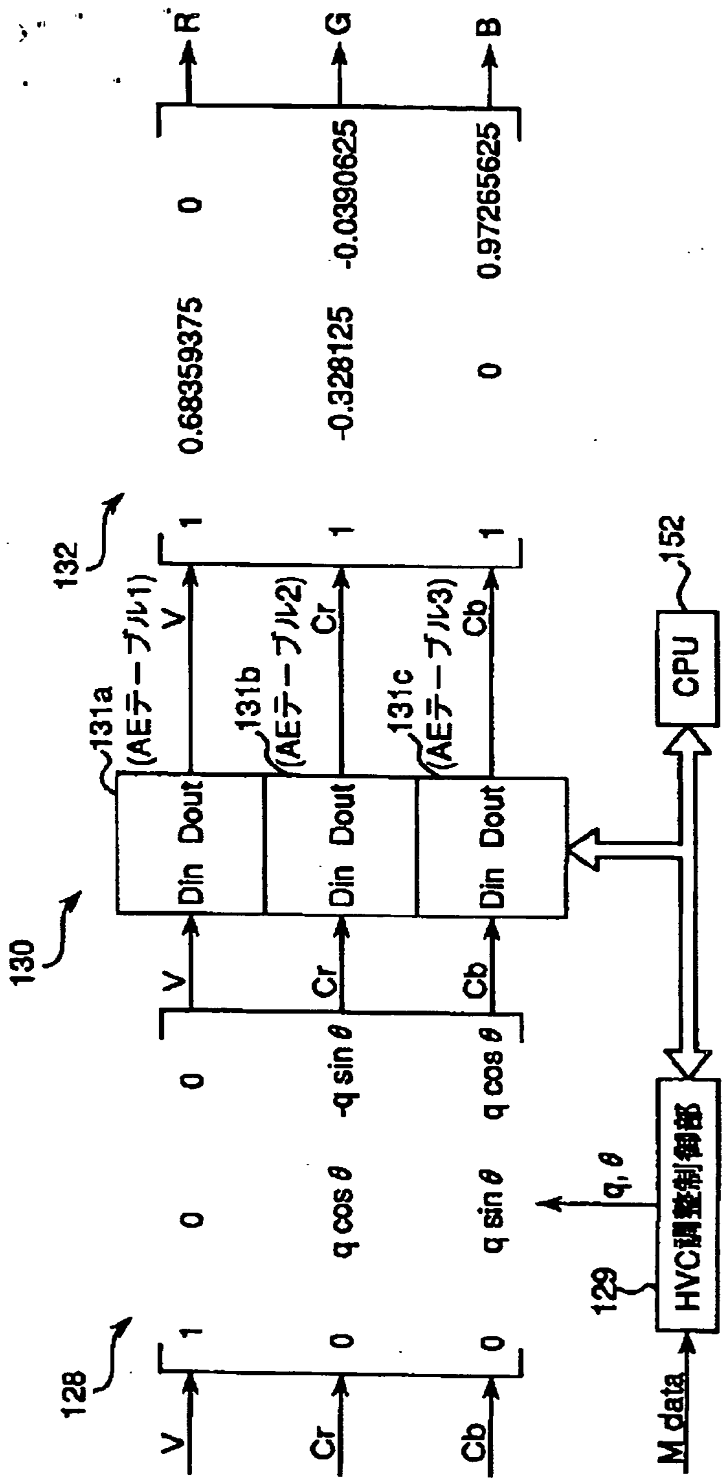
[Drawing 36]

0	0	0	0	0
0	1/16	3/8	1/16	0
0	1/8	1/4	1/8	0
0	1/16	1/8	1/16	0
0	0	0	0	0

[Drawing 37]

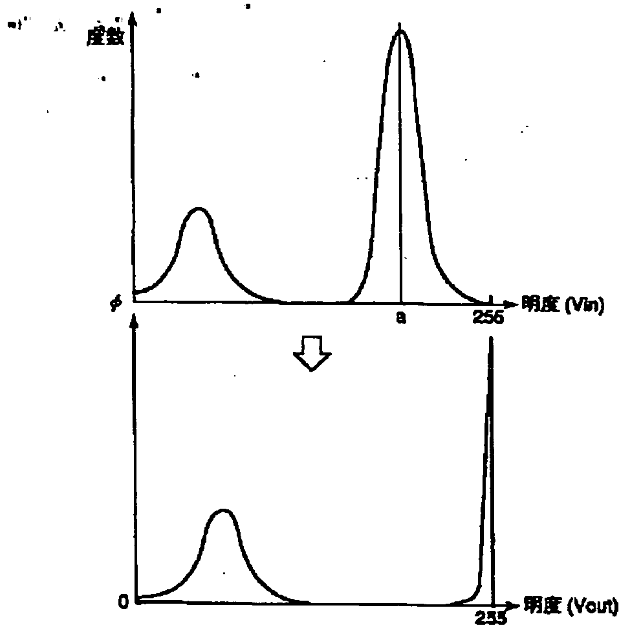
0	0	0	0	0
0	1/64	3/32	1/64	0
0	3/32	9/16	3/32	0
0	1/64	3/32	1/64	0
0	0	0	0	0

[Drawing 11]

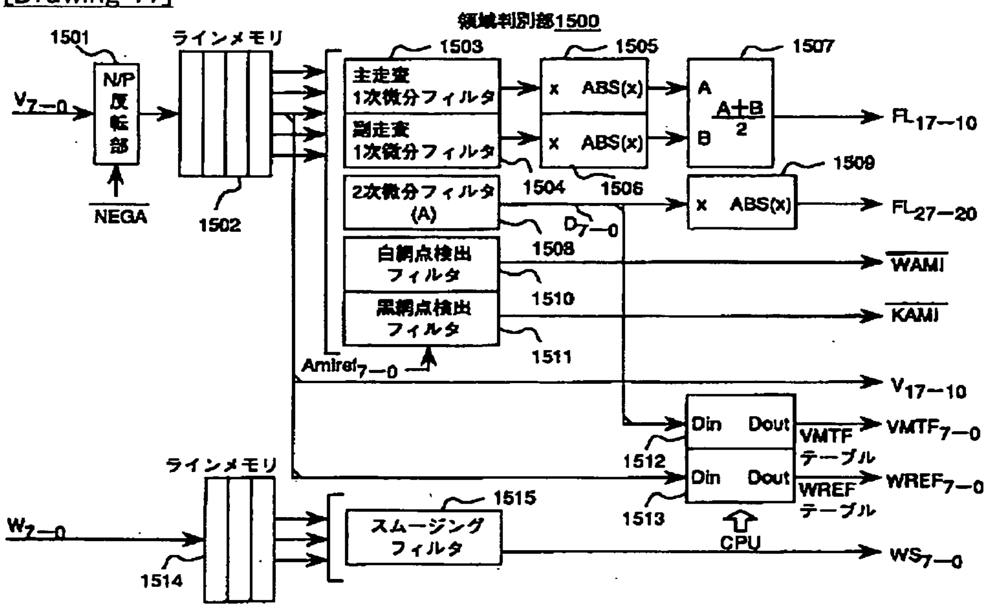


128
V
Cr
Cb
1 0 0
0 q cos θ q sin θ
0 -q sin θ q cos θ
130
Din Dout
131a (AEテーブル1)
131b (AEテーブル2)
131c (AEテーブル3)
132
1 0.68359375 0
1 -0.328125 -0.0390625
1 0 0.97265625
R
G
B
CPU
152
HVC調整制御部
129
q, θ
M data

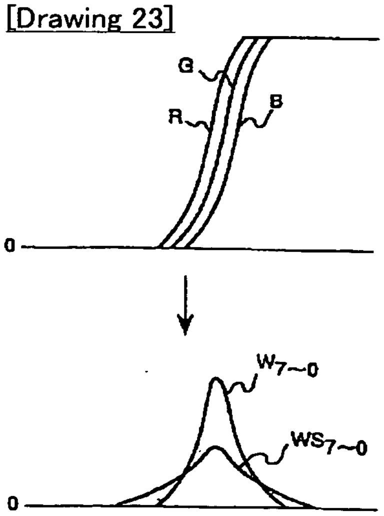
[Drawing 13]



[Drawing 17]

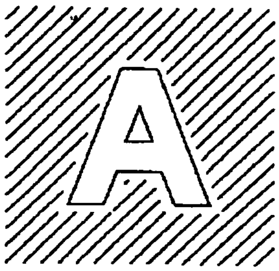


[Drawing 23]

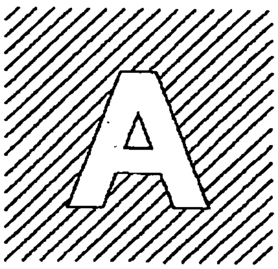


[Drawing 39]

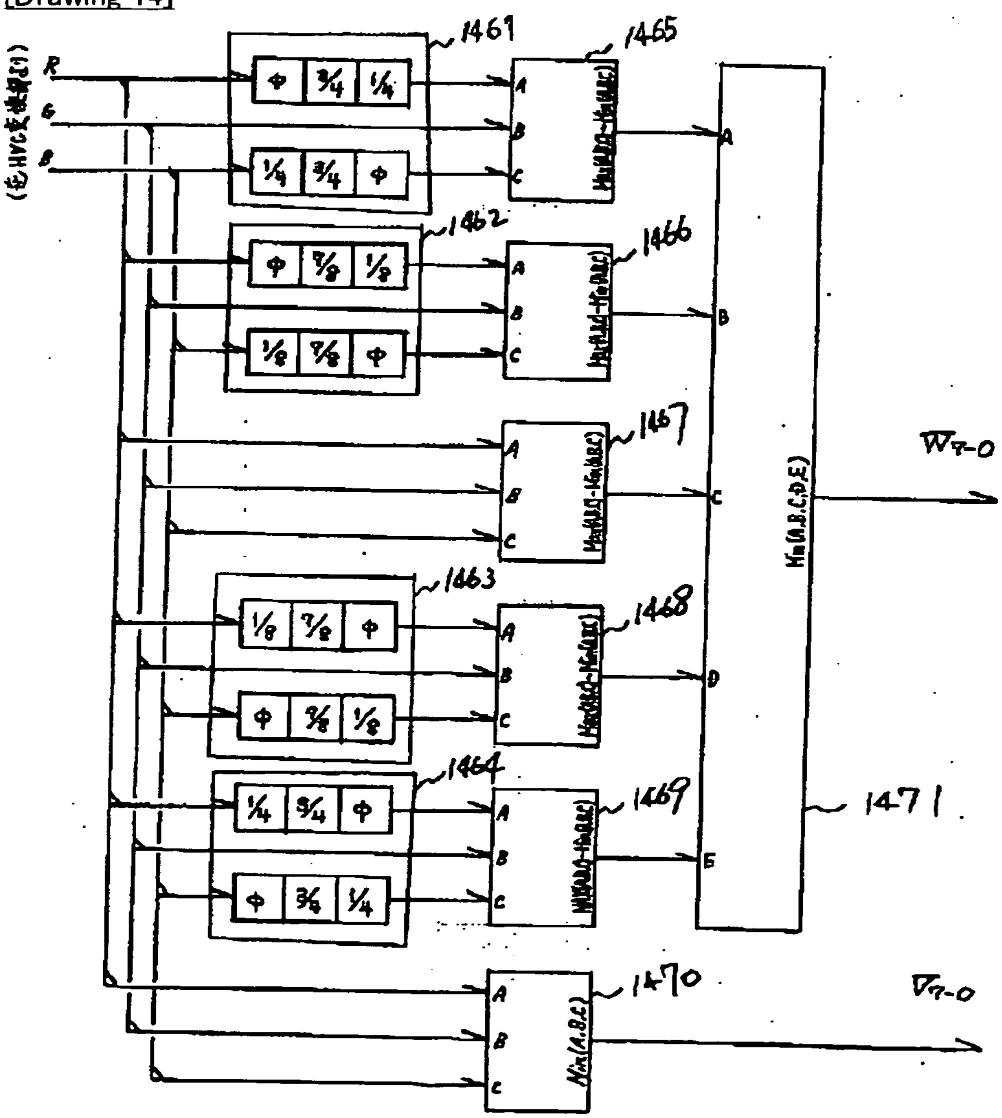
(a)



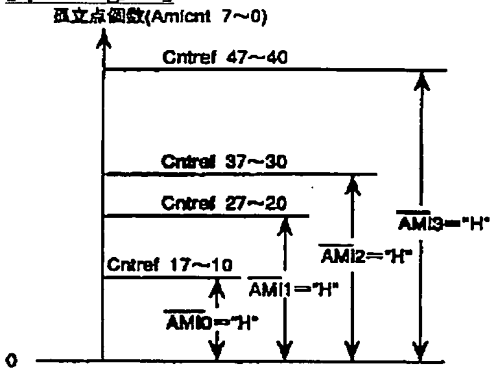
(b)



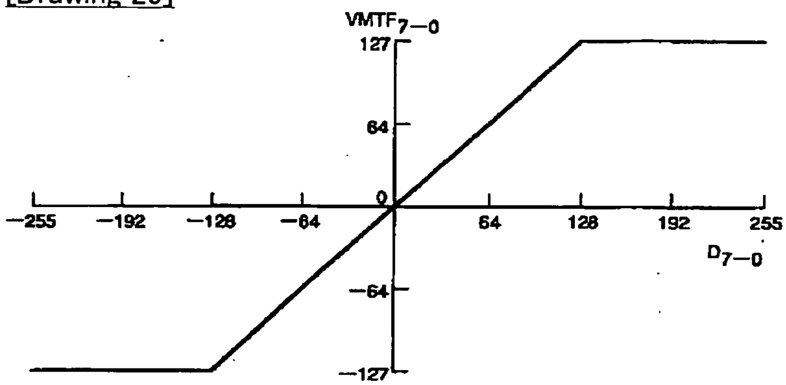
[Drawing 14]



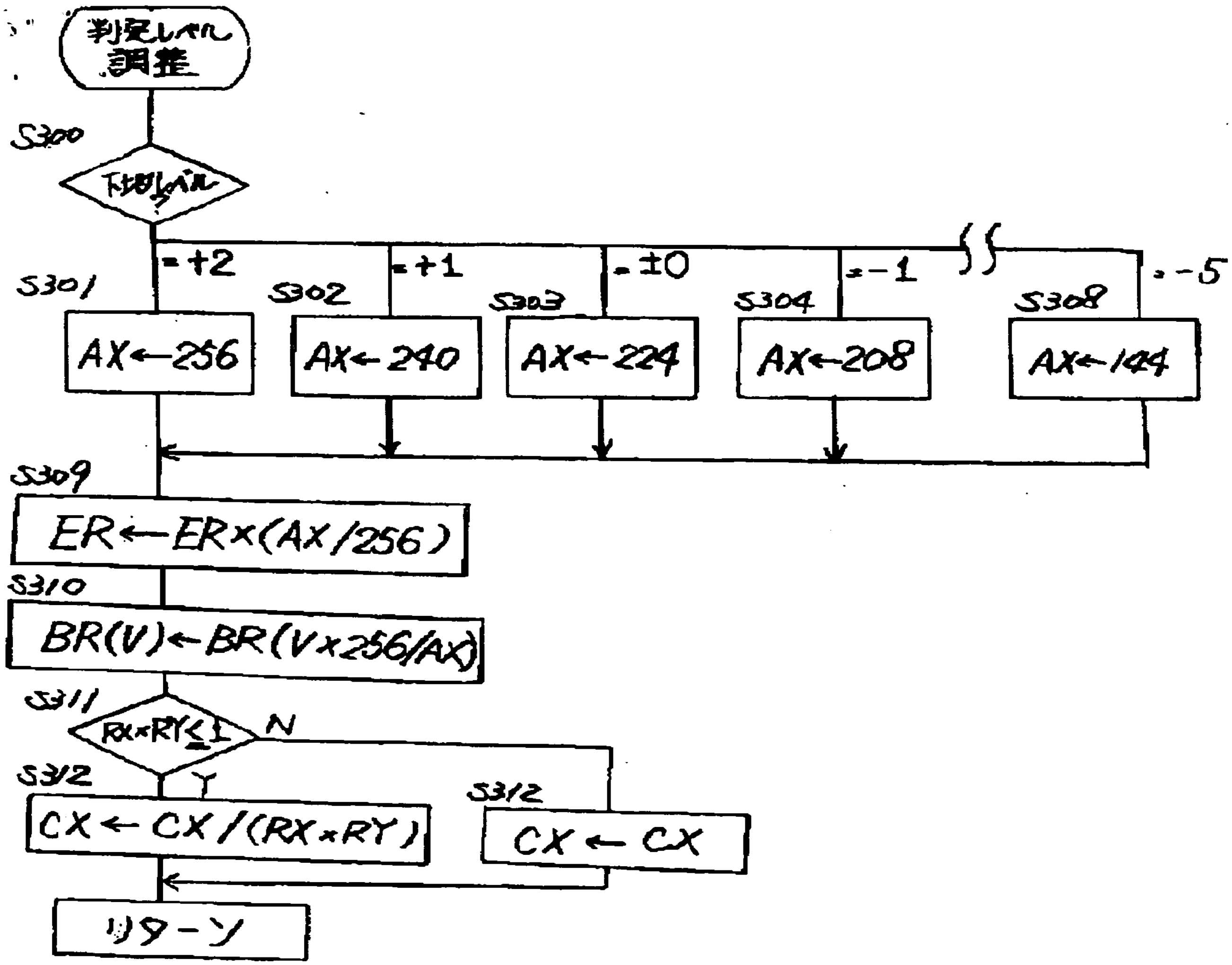
[Drawing. 28]



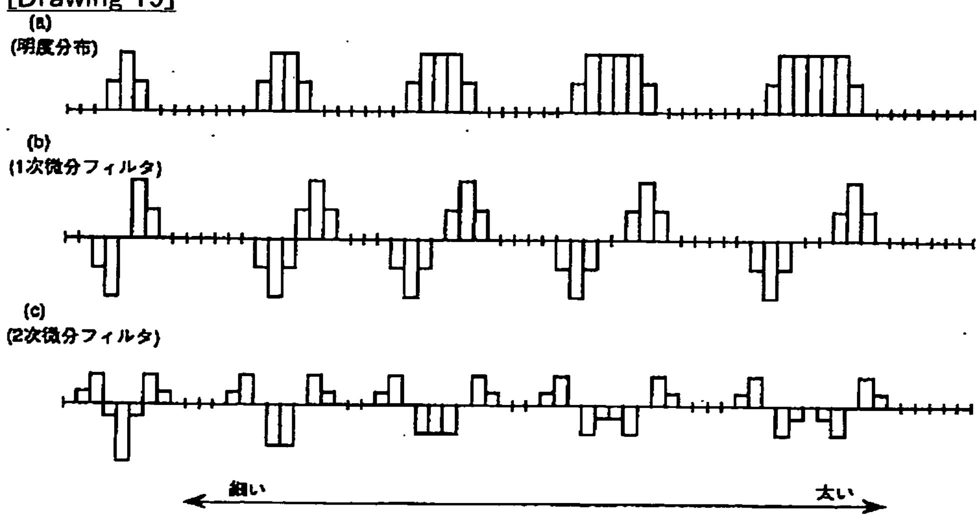
[Drawing 29]



[Drawing 15]



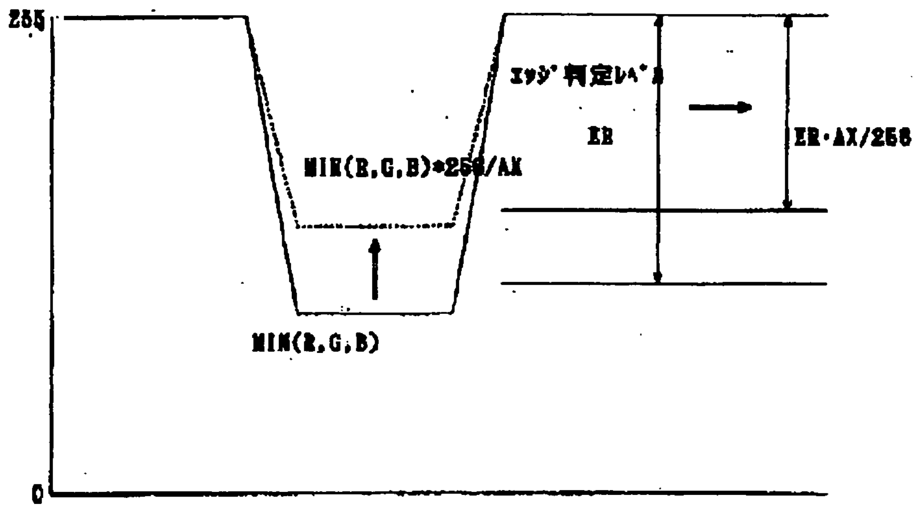
[Drawing 19]



[Drawing 16]

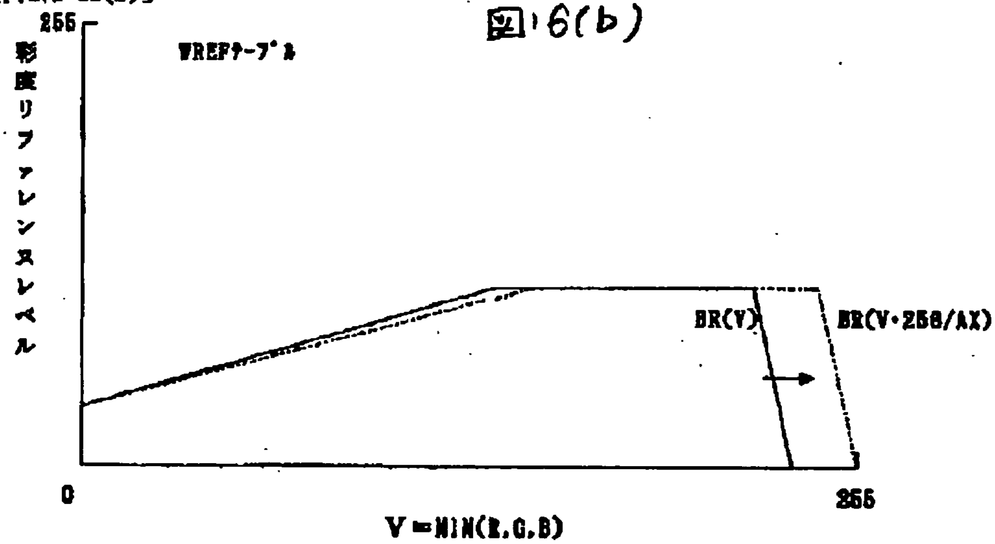
図16(a)

[FIG.8-56(a)]

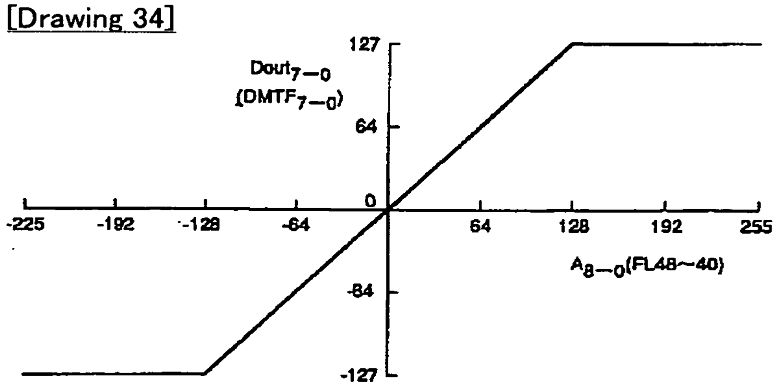


[FIG.8-56(b)]

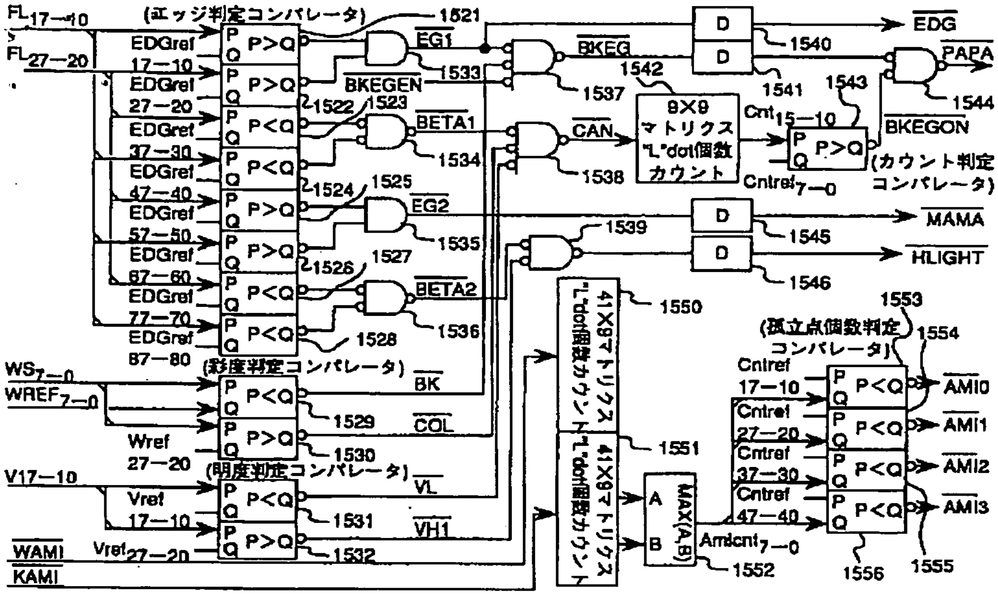
図16(b)



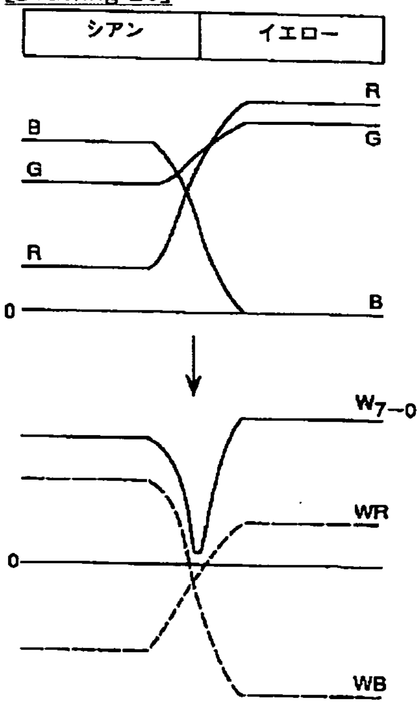
[Drawing 34]



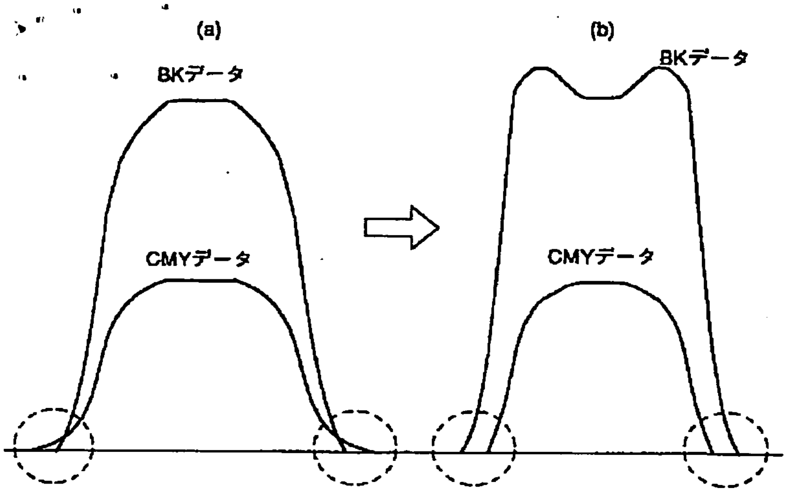
[Drawing 18]



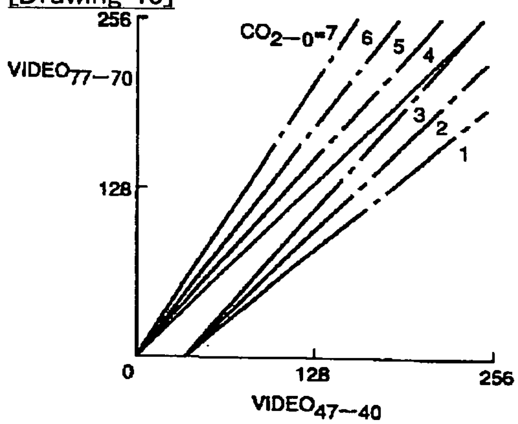
[Drawing 26]



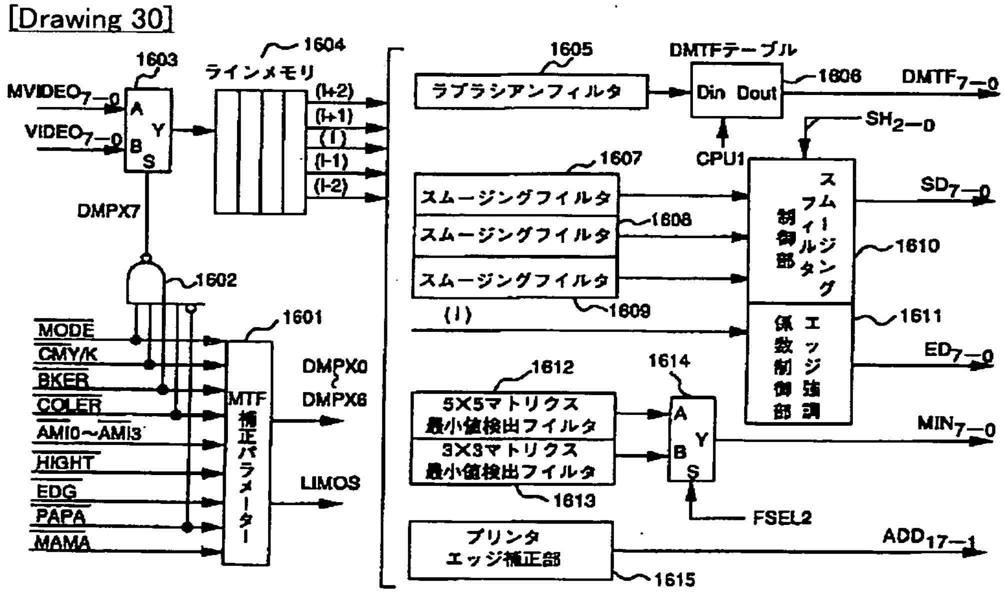
[Drawing 38]



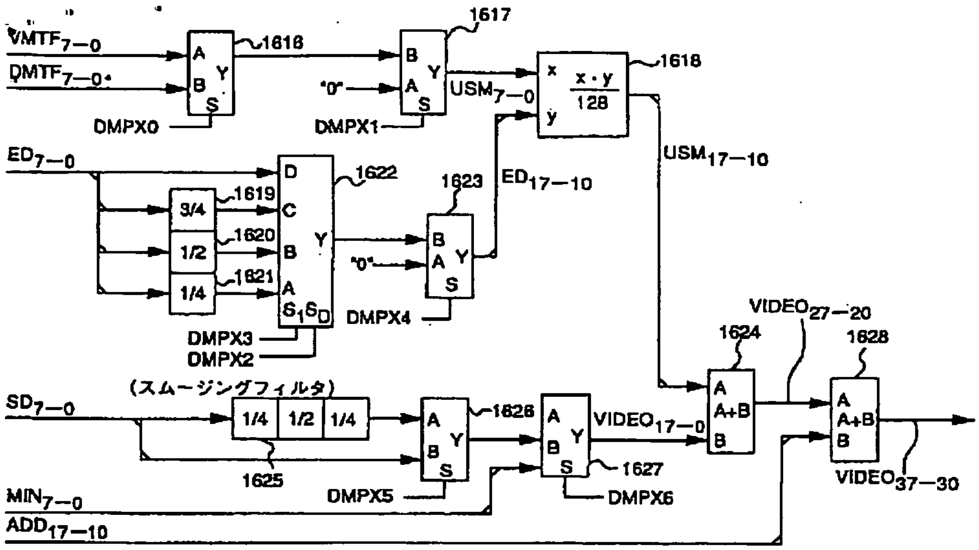
[Drawing 46]



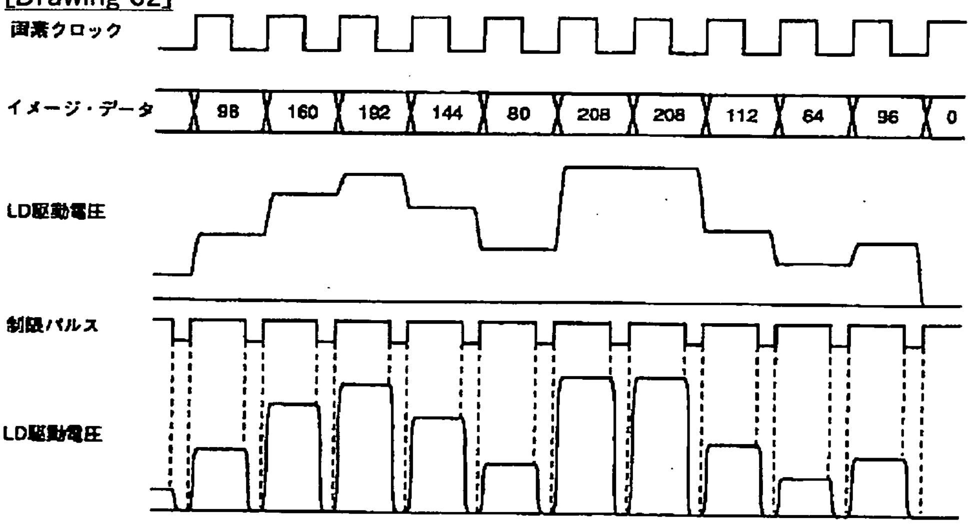
[Drawing 30]



[Drawing 31]

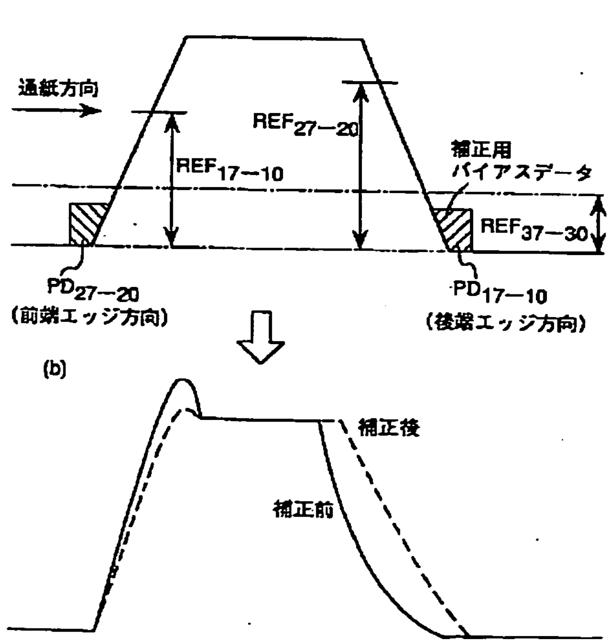


[Drawing 32]

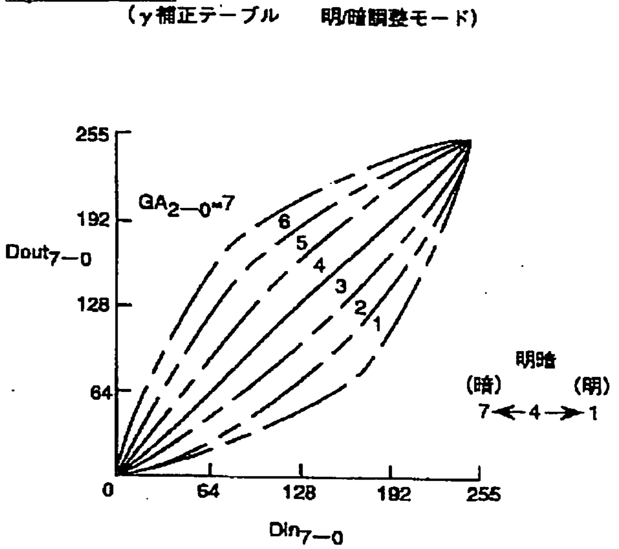


[Drawing 40]

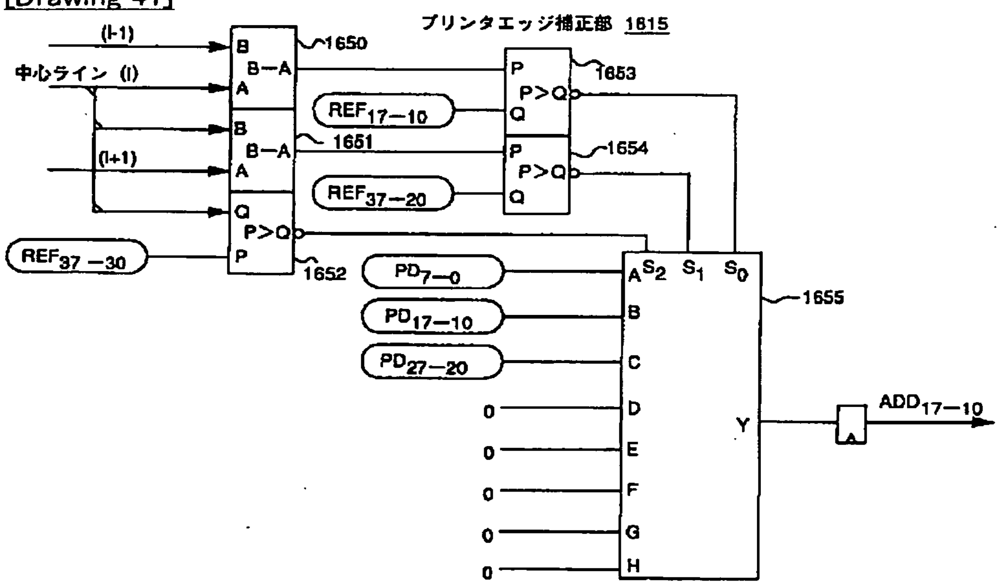
(a)



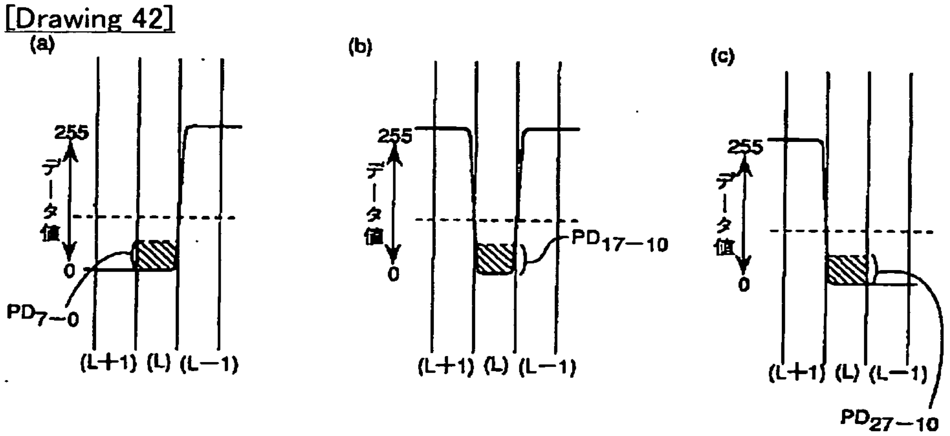
[Drawing 44]



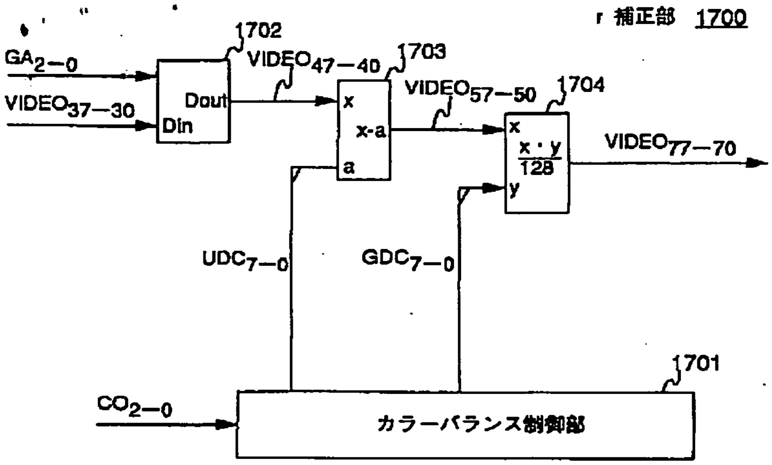
[Drawing 41]



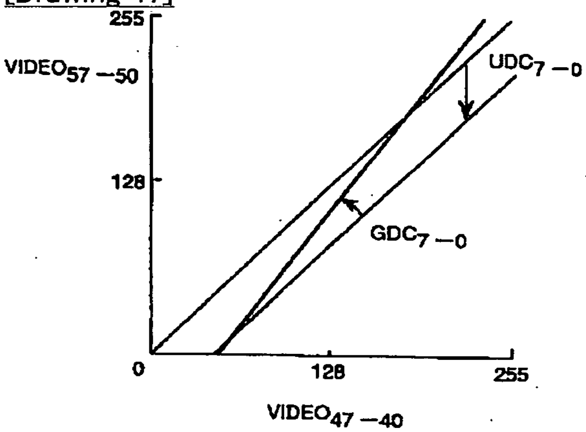
[Drawing 42]



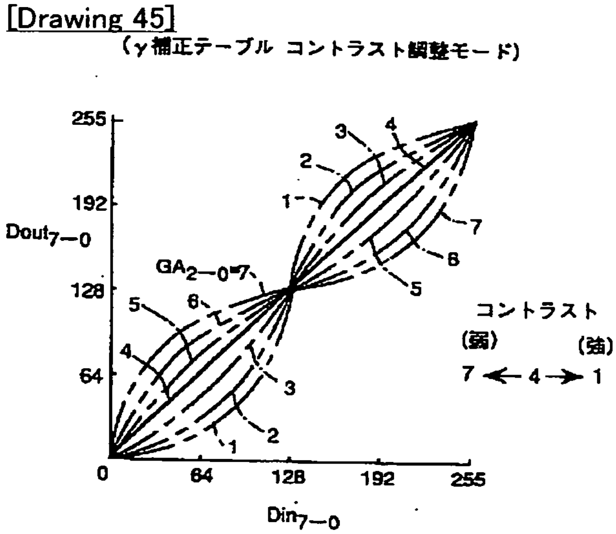
[Drawing 43]



[Drawing 47]



[Drawing 45]



[Translation done.]